OFF-BALANCE SHEET CONTINGENT COMMITMENTS BY BANKS: VALUATION, INFLUENCES, AND RISK

By

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This dissertation is dedicated to
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Banks have become increasingly involved in activities that lead to off-balance sheet reporting. However, little is known about the usefulness of disclosures on these activities. The unique quality of contingent commitments is that the asset part of these agreements goes to the balance sheet (in the form of fees) while the liability remains off-balance sheet.

This dissertation consists of three essays that examine two types of contingent commitments and their valuation, use, and risk implications. The results from analyzing quarterly data from 85 bank holding companies between 1986 and 1991 show that supplementary disclosures of these activities provide incremental information about the value of the bank. Specifically, disclosures of third party guarantees reflect the banks' potential liability as insurers, but loan commitment disclosures appear to convey information about future loan opportunities. Regulatory risk-based capital requirements are found to affect the relative value of issuing these commitments.

The analysis also shows that the use of contingent commitments conveys information about banks' lending strategies. Banks that are more aggressive in issuing loan commitments and third party guarantees are also more intensive in their balance-sheet lending. Despite the imposition of additional capital requirements on these activities in 1988, banks have continued to increase their use of these instruments. However, the imposition of risk-based capital has slowed the growth of third party guarantees especially for poorly capitalized banks.

In the third essay I examine the contribution of contingent commitments to equity risk. Contrary to previous research findings, third party guarantees are negatively related to bank equity risk. Furthermore, the imposition of risk-based capital has not changed the relationship between third party guarantees and bank risk. In addition, prior to risk-based capital, loan commitments were negatively related to bank equity risk. This association is not significantly different from zero in the post-risk-based capital period. This change in the relationship between loan commitments and bank equity risk suggests that other changes in the banking environment have occurred since the adoption of risk-based capital. This issue will be the subject of further research.

CHAPTER 1
OVERVIEW

Increased regulation and industry competition have driven banks to seek new ways to generate profits. One of the observed changes in the banking industry over the last decade has been the large growth in off-balance sheet banking. Disclosures of these activities appear in footnotes. Since these disclosures are reporting contingencies, the difference between what can be objectively measured and the underlying value can be substantial. This dissertation focusses on two types of contingent commitments: third party guarantees and loan commitments. Three essays examine their disclosures and address (1) the factors that determine the amount of these contingencies chosen by a bank, (2) how these commitments are valued by equity markets, and (3) how the level of these commitments affect the risk of the bank's equity.

Loan commitments and third party guarantees are both contingent promises to lend in the future. The contingent feature leads to their being exercised under different conditions. Third party guarantees are typically used to insure against credit and liquidity risk. These are activated by the borrower's default. With loan commitments, the bank agrees to lend up to a certain amount of money to the borrower. However, these agreements typically contain a "material-adverse-change" clause. Loan commitments reduce borrower uncertainty regarding the availability of credit. Differences in credit risk are evidenced by the difference in fee rates charged on the two types of commitments. An industry source quoted rates of 25 basis points on unused loan commitments between $10 and $20 million, and zero for loan commitments less than $10 million. The rate charged on third party guarantees is currently around 1.5% of the face value outstanding, which is six times that of loan commitments.

In 1988 the Federal Reserve System adopted guidelines that attempt to associate capital requirements with banks' assessed level of credit risk. Under this new regulation banks are required to maintain adequate capital against both balance sheet and off-balance sheet activities. Since capital had previously been assessed as a percentage of total assets, the new regulation has increased regulatory costs on contingent commitment activities. In addition, the risk-based capital guidelines imposed a higher capital requirement on third party guarantees than it did on loan commitments. This raises several interesting issues about the effects of this regulation on the value of off-balance sheet activities, and banks' response to the regulation.

In the first essay, bank attributes that influence the relative levels of loan commitments and third party guarantees are examined. The study finds that the use of contingent commitments conveys information about banks' lending strategies. In an increasingly competitive banking environment it appears that banks that are more aggressive in issuing loan commitments and third party guarantees are also more intensive in their lending activities that appear on the balance sheet. Despite the imposition of capital requirements on these activities in 1988, banks have continued to increase their use of loan commitments. Risk-based capital imposed a heavier capital requirement for third party guarantees. The effect of this requirement is the decline in the growth of third party guarantees after the change to risk-based capital took place.

The second essay addresses the question of whether contingent commitment disclosures convey information that is relevant to investors' valuation of bank equity. Since third party guarantees and loan commitments are disclosures of contingencies, their values are not a direct dollar for dollar mapping from the face value of the promise. In addition, the fee structure of third party guarantees makes these instruments difficult to value. Fees are booked in the financial statements while the obligation remains off-balance sheet. The analysis shows that supplemental disclosures of third party guarantees reflect the banks' potential liabilities as insurers. However, loan commitment disclosures appear to convey information about future loan opportunities. Consistent with expectations and the result of the first essay, I find that regulatory risk-based capital requirements affect the relative value of issuing these commitments.

In the third essay, the contribution of contingent commitments to equity risk is examined. The results are contrary to the findings of previous research. Third party guarantees are negatively related to bank equity risk. Further, the imposition of risk-based capital has not changed the way in which third party guarantees affect bank risk. Loan commitments are negatively related to risk in the pre-risk-based capital period, but the association is not different from zero in the post-risk-based capital period. Although this result requires further analysis, it could suggest that other changes in the banking environment have occurred following the adoption of risk-based capital.

These three essays provide indications that nominal disclosures of contingent activity are used by the market to evaluate banks. Specifically, the market recognizes these commitments to be liabilities and values them accordingly in setting bank stock prices. When regulatory costs are imposed on these activities their value is eroded.

Three unexpected results arise from the dissertation relating to loan commitments. The values of these activities increased after a regulatory tax was imposed on them. Also, in the post-risk-based capital period the association between equity risk and loan commitments changed from prior levels under pre-risk-based requirements. Finally, despite the increased cost to issuing these types of commitments, banks continued to issue them in increasing amounts. These anomalies may be related to changes in the banking environment and reflect the increased importance of the bank/customer relationship. These unresolved issues will be the subject of future research.

CHAPTER 2
LITERATURE REVIEW

Introduction

Although no studies have examined commitment disclosures of banks in this context, significant effort has been devoted to examining why loan commitments and standby letters of credit exist. A discussion of the nature of loan commitments and standby letters of credit, and a review of the existing theories on why they are used follows.

Prior Studies on Supplemental Disclosures of Banks

Three types of supplemental disclosures by banks have been the focus of prior studies: (i) nonperforming loan data, (ii) maturity/repricing data, and (iii) disclosures on the market value of the investment portfolio.

Beaver, Eger, Ryan, and Wolfson (1989) and Berger, Kuester, and O'Brien (1990) examined whether disclosures on nonperforming loans provide incremental information over allowance for loan loss data. Beaver, Eger, Ryan, and Wolfson (1989) find that supplementary nonperforming loan data, controlling for allowance for loan losses (which is disclosed in the balance sheet) is a significant determinant of the ratio of market-to-book values of common stock. This result is consistent with the findings by Berger, Kuester, and O'Brien (1990) that nonperforming loan data, when controlling for allowance for loan losses, can predict eventual loan charge-offs.

Supplemental disclosures on the maturity/repricing structure of banks' balance sheets have been found to explain exposure to interest rate risk. Flannery and James (1984) examine whether supplemental disclosures on balance sheet maturity composition explain interest rate sensitivity of bank stock returns. Using a two factor market model they find that bank stock returns are sensitive to changes in interest rates and, more importantly, that this sensitivity is related to balance sheet composition (i.e. repricing profile of net assets). Beaver, Eger, Ryan, and Wolfson (1989) find that disclosures on the maturity structure of the loan portfolio alone (without considering the maturity structure of liabilities) explains part of the market-to-book ratio.

The third type of supplemental disclosure that has been examined relates to banks' marketable securities portfolios. In the balance sheet, the investment portfolio is carried at book value with market values being disclosed in the footnotes. Barth (1994) finds that market values of investment securities are significant in explaining bank stock prices but are not significant in explaining stock returns. Ahmed and Takeda (1994) find that when changes in interest rates and the interest rate sensitivity of a bank's portfolio are included in a model of bank returns, both realized and unrealized gains on investment securities are positively related to bank stock returns.

These studies provide evidence that some supplemental disclosures convey information that is incremental to balance sheet disclosures, and that this information is used by the market in arriving at stock prices.

Third Party Guarantees

This section reviews the extant literature on loan commitments and standby letters of credit. These studies are primarily devoted to supplying explanations for their existence, which could help in understanding the value implications of these commitments, and how this may be conveyed in their disclosures.

Standby letters of credit (SLCs) make up the largest component of off-balance sheet guarantees issued by banks. The most common form of SLCs commit the bank to meeting a customer's obligations to a third party in case of default. The bank is essentially providing the borrower with its credit rating and financial backing in exchange for a fee. SLCs are most commonly used to back commercial paper offerings, municipal borrowings, construction loans, bid or performance bonds, and acquisition debt.

Commercial letters of credit (CLC) or banker's acceptances are another type of guarantee that are issued less frequently than SLCs and are generally less risky. These are used to facilitate international trade transactions where it is difficult to assess customer credit rating. Commercial letters of credit guarantee payment by the bank on behalf of the bank customer who is purchasing goods from the seller. These types of guarantees are issued less frequently than SLCs. Hence, the following discussion focusses primarily on SLCs.

Since the early 1980s the dollar volume of SLCs issued has increased dramatically. The growth in SLCs is attributed to the increase in direct financing. Firms discovered that they could obtain funds by directly issuing financial instruments, such as commercial paper, at a lower cost than by bank loans. Because investors in these markets are bearing more risk than if they simply deposited their money in banks, they generally require guarantees that decrease their risk exposure. Banks realized that SLCs guaranteeing commercial paper were directly competing with their own business of issuing loans and shifted their portfolio to became more involved in providing liquidity guarantees of municipal bonds (Andrews and Sender 1986).

One of the basic motivations for firms contracting to purchase SLCs from banks is the attendant reduction in their borrowing costs. Standby letters of credit are beneficial to the borrower when the cost of the SLC is less than the present value of the cost savings resulting from the purchase of the SLC. This implies that the value of the SLC is tied to the credit worthiness of the issuing bank relative to the borrower, and the relative cost of obtaining information about the issuing bank.[1]

The cost of capital argument is developed by Kanatas (1987) in a signalling model. He posits that firms contract for SLCs to signal the unobservable quality of their project, which in turn reduces the firm's cost of capital.

In addition to credit quality considerations, SLC guarantees are increasingly used to provide liquidity for municipal bond issuers in the event that put options on their bonds are exercised. In a volatile interest rate environment, putable bonds expose the issuer to a high degree of liquidity risk. If interest rates increase above the coupon rate on these bonds, a sudden demand for liquidity arises.[2]

On the supply side, there are several reasons why banks issue SLCs. Since SLCs behave as insurance for bank customers they are expected to be exercised under adverse conditions for the borrower. Value is generated for the bank when they are issued, but not when exercised.[3] One of the most commonly cited reasons for off-balance sheet banking is that it generates fee revenues (and increases return on assets) without an associated liability disclosed in the financial statements. This activity was more profitable for banks prior to 1989 when capital regulations were less restrictive. In addition to the benefits arising from fee revenues generated from these activities, the benefits associated with the risk characteristics of SLCs also provide reasons why a bank might issue them.

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[1] This argument is developed by Kidwell, Peterson and Blackwell (1993).

[2] See Calomiris (1989) for a discussion of the liquidity motivation for SLC demand.

James (1988) presents two alternative explanations for why banks issue SLCs. The moral hazard hypothesis states that issuing SLCs is a method by which a bank can increase leverage without adversely affecting the balance sheet. Thus, SLCs allow banks to enhance their subsidies from deposit insurance. The second motivation for issuing SLCs is called the collateralization hypothesis. An underinvestment problem arises, when firms pass up low risk positive net present value projects, in the presence of risky debt because such projects reduce the riskiness of existing debt and result in wealth transfers from stockholders to debtholders (Myers 1977). In the case of banks, the FDIC takes the place of risky debtholders. Banks prefer to issue SLCs rather than bank loans because SLCs reduce the underinvestment problem by increasing the variance of returns.

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[3] A Federal Reserve Board study found that in 1978 only 2.03 percent of the SLCs outstanding defaulted and losses were even smaller because 98% of payments due were ultimately recovered (Kidwell, Peterson and Blackwell 1993). The statistics from this study are limited in their use to describe the current environment since SLC activity has undergone significant changes since 1980.

That is, in addition to the value generated from fees, SLCs are believed to provide value to bank equityholders through the avoidance of a regulatory tax by operating off-balance sheet, by increasing the return on assets, and by enhancing the subsidies to equityholders from the FDIC.

Loan Commitments

Loan commitments are arrangements where a bank lends up to an agreed upon amount of money, provided that the borrower meets certain restrictions. These commitments expose the bank to two types of risk: fluctuations in individual customer demand, and fluctuations in the general cost of credit. In return, the borrower pays a fee on the unused balance of the commitment.[4] With revolving credit agreements, the loan can be repaid in part or in full at any time during the commitment term. These arrangements reduce the borrowers' uncertainty about cost and availability of credit and allow the firm to acquire funds on demand. Several theories posit why loan commitment contracts dominate spot loan transactions. It is argued to result from the ability of loan commitment contracts (1) to help to perfect financial markets, and (2) to solve the moral hazard and adverse selection problems between the lender and borrower.

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[4] Most recently, competition has driven the fee rate on loan commitments to zero in many markets.

As to the first hypothesis, Campbell (1978) shows that banks generate profits from fees on the unused balances and from interest on issued portions of loan commitments. In a setting where (ex ante) the bank does not know its cost function and borrowers do not know their alternative borrowing costs, a bank will issue three types of commitment products: fixed rate loan commitments, loan commitments with rates tied to borrowers' costs, and loan commitments with rates tied to the bank's cost of funds. Sprenkle (1987) recognizes a need to balance funding, reserve requirements, and issuing of loan commitments and offers a model of bank behavior that incorporates loan demand and deposit uncertainty. He concludes that loan commitments reduce the bank's uncertainty by diversifying the risk that arises from spot loans.

Another way in which loan commitments help perfect financial markets is by reducing contracting costs through repeat dealings (James 1982). Spot loans are one time transactions that may recur but require re-contracting each time. Loan commitments (revolving credit agreements, in particular) allow borrowers to take down part of the commitment and repay the loan many times over the life of the commitment.[5] These economies of scale associated with loan commitments make this type of contracting cost advantageous for both parties over spot loan transactions.

Melnik and Plaut (1986) show that differences in the way risk is priced for loan commitments and spot loan transactions cause one or the other type of these contracts to dominate under different conditions. With loan commitments the default risk premium is collected upfront as fees, whereas for spot loans the risk premium is incorporated into the loan fee rate as a function of leverage. Therefore, when default risk is independent of takedown amounts the loan commitment contract dominates spot loans.

Others argue that loan commitments reduce the moral hazard problem through the multiple fee structure that does not exist with spot loans. Boot, Thakor, and Udell (1987) use a game-theoretic framework to show that (fixed rate) loan commitments reduce project choice distortions attributable to changes in interest rates that occur with spot loans. Berkovitch and Greenbaum (1991) show that the upfront usage fees allow banks to offer a lower interest rate on loans taken down, which induces borrowers to proceed with positive net present value projects that otherwise would be foregone.

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[5] Some types of loan commitments require that loans taken down under commitment must be paid back once during the commitment term.

The multiple fee structure has also been shown to reduce the adverse selection problem. Thakor and Udell (1987) posit that this type of fee structure results in optimal risk sharing when banks do not know the takedown probabilities of borrowers. Thakor (1991) shows that borrowers separate themselves out by their contract choice. Firms with favorable prospects choose to pay an upfront fee for a loan commitment that results in lower interest rates when the commitment is taken down. Firms with unfavorable prospects choose to wait until the profitability of their project is revealed before borrowing, and hence choose to use spot loans.[6]

Avery and Berger (1991) demonstrate that loan commitments increase bank risk exposure. However, using survey data obtained by the Federal Reserve Board, they find that loans from commitments have slightly lower default losses than other loans. They conclude that either loan commitments do not generate much risk or that the process of acquiring loan commitments results in sorting of good versus poor quality borrowers. This latter explanation is consistent with the belief that loan commitments reduce the adverse selection problem.

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[6] This is similar to Kanatas (1987) in which the demand for commitments to back dealer-placed commercial paper is examined. He argues that loan commitments allow high quality firms to distinguish themselves from low quality firms.

Summary

Prior research on bank loan commitments and guarantees has been (almost exclusively) theoretical investigations focussed on the question of why banks issue these commitments. Guarantees provide borrowers with insurance, which decreases their cost of capital. The benefits to banks from issuing guarantees include the revenues generated and wealth transfers from the FDIC to the issuing banks due to the increase in banks' risk arising from these instruments. The value to the bank of issuing loan commitments has been presumed to be nonnegative but continued to be more of a puzzle, especially since they directly compete with banks' spot loans. Their values appear to be derived from reduced transaction costs as well as from reduction in adverse selection and moral hazard problems.

Existing research has not addressed the market's use and interpretation of disclosures of these two off-balance sheet activities, which is the focus of this dissertation.

CHAPTER 3
ECONOMIC DETERMINANTS OF CONTINGENT COMMITMENT ACTIVITY

Introduction

This chapter focusses on commitments that are contingent promises by banks to lend to clients at a future time in exchange for fees. Such commitments constitute one of the largest components of off-balance sheet banking activities. Prior to the adoption of risk-based capital (RBC) requirements in 1988, banks had the incentive to participate in off-balance sheet activities to circumvent regulatory capital and reserve requirements that were based solely on balance sheet items. Capital requirements were calculated on a straight percentage of reported total assets, and banks were not required to hold additional capital or reserves against off-balance sheet activities.

In 1988 the Federal Reserve System approved the adoption of risk-based capital (RBC) requirements. Under this regulation, the required capital calculation is based on the risk of a bank's asset portfolio, which includes off-balance sheet activities. Critics have argued that the rules of risk-based capital reduced banks' incentives to issue commitments and thereby resulted in reduced lending and leading to a credit crunch.

This chapter documents the trend observed in banks' contingent commitment activity over time and examines the determinants of off-balance sheet activity in an attempt to explain how the imposition of a new capital regulation affected bank behavior. Off-balance sheet disclosures reflect the dollar amounts of commitments that have not been taken down by a bank's clients. The observed level of unexercised commitments may be affected by bank specific factors that influence their desire to issue commitments, and by economic conditions that influence the extent to which clients demand funds from commitments. Several factors are examined that are believed to influence the levels of third party guarantees (TPGs) and loan commitments (LCs) reported by banks.

Three hypotheses are posited to examine the potential determinants of the intensity of banks' contingent-commitment activity. One of the primary considerations associated with loan commitments is the cost of funding commitments that are taken down. Under the funding risk hypothesis, off-balance sheet activities are considered favored by highly liquid banks that are less likely to require costly funds (obtained from securities issuances or sales of illiquid assets) to finance any takedowns of loan commitments.

The second hypothesis proposes that the moral hazard problem created by FDIC deposit insurance induces banks to increase the risk of deposits by issuing more commitments. The moral hazard hypothesis predicts that less capitalized banks will issue more contingent commitments to maximize the value of the implicit put option associated with deposit insurance.

The third hypothesis examined in this study is the risk-based capital (RBC) hypothesis. Risk-based capital requirements are expected to reduce the level of commitment activities that are weighted more heavily under RBC rules. Further, banks with low capital levels are expected to be more adversely affected since RBC makes off-balance sheet banking relatively more costly for these banks. The RBC hypothesis predicts that the incentives to engage in high levels of commitment activity declined after RBC, especially for poorly capitalized banks.

This chapter uses Federal Reserve Y-9 disclosures for 85 bank holding companies pooled over the period June 30, 1986, through December 31, 1991. The sample is partitioned into pre- and post-RBC periods. Panel data analysis is used to examine the levels of TPG and LC activity relative to total assets (i.e. the intensity of TPG and LC activity) as a function of liquidity, capital, maturity structure, and risk. As the moral hazard hypothesis predicts, small banks with more risky balance sheet activities are more intensely involved in issuing third party guarantees. Also, banks with lower liquidity are more actively involved in issuing TPGs, which is consistent with the moral hazard hypothesis.

The results of this analysis provide evidence consistent with the third hypothesis: risk-based capital requirements reduced the incentives of banks to issue certain types of commitments. Risk-based capital appears to have inhibited the tendency of firms with higher balance-sheet risk to take on high levels of TPGs as well as influencing the composition of overall commitment activity for the industry. Differences in the relative levels of commitment activity are observed across size classifications, which might be attributed to differences in commitment demand faced by banks of different size.

Additionally, disclosures on contingent commitment activity appear to reflect bank strategy. Banks with relatively greater balance sheet loan activity tend to grant relatively more off-balance sheet loan commitments.

Economic conditions influence banks' decisions to issue contingent commitments and also affect the use of these commitments by firms. When the economic outlook is good, banks are expected to issue more commitments. Under this scenario bank clients would be expected to demand less of TPGs and more of LCs.

The remainder of the chapter is organized as follows. The next section provides a brief description of the three hypotheses about the factors likely to influence commitment activity and their empirical implications. Next I describe the data and present descriptive statistics. The following section discusses the results of empirical tests, and the final section summarizes and concludes the chapter.

The Economics of Contingent Commitments

This section begins by discussing the two types of contingent commitments examined in this study. Next, I discuss the role of costly funding on banks' decisions to issue loan commitments, followed by a discussion on the moral hazard problem created by FDIC insurance and how it affects certain banks' determination of loan commitment activity levels. Finally, the impact of risk-based capital requirements on contingent commitment activity is discussed.

Types of Commitments

Contingent commitments can be classified into two groups based on the conditions under which they are exercised. Standby letters of credit and commercial letters of credit are third party guarantees (TPGs) that resemble insurance policies, while loan commitments (LCs) are essentially revocable pre-loan agreements.

Standby letters of credit (SLCs) are primarily used to guarantee commercial paper, municipal borrowings, and construction loans. There are two basic types of SLCs. The first type provides insurance against credit risk to third parties, and the second type provides the borrower with a liquidity guarantee. Contracting with a bank for the first type of SLC allows the borrower to reduce its cost of capital in financial markets.[1] The bank accepts a fee upfront in return for the promise to pay the third party in the event of default by the borrower. These SLCs are activated by borrower default and are directly analogous to insurance policies. The bank's guarantee is exercised when the borrower defaults on an obligation to the designated third party.

The second type of SLC is called an irrevocable revolving credit (IRC) agreement. These contracts act as insurance against liquidity risk for the borrowers since the bank promises to lend them money to fund their commitments. Irrevocable revolving credit agreements are often exercised by the borrowers in special cases such as when they try to rollover their commercial paper in a tight credit market. In these situations, borrowers exercise their SLCs and use bank funds temporarily until they are able to issue their own commercial paper. These SLCs are also used to ensure liquidity for putable municipal bonds.

Loan commitments (LCs) are agreements whereby the bank commits to lend up to a certain amount of money and borrowers must pay fees on the unused portions of the commitments. Loan commitments are exercised under less adverse conditions than SLCs, and are also revocable by the issuing bank when the borrowers become risky to banks. Loan commitments are used by borrowers to reduce uncertainty about the availability of credit. The fee rate charged on these types of commitments are nominal and can be zero for some commitments. The value of LCs to banks is derived from the interest earned on loans that are issued when the commitments are exercised. In fact, the majority of commercial and industrial loans arise from LCs. The Federal Reserve reports in their "Terms of Lending at Commercial Banks Survey" for the week of November 4-8, 1991 that 74.1% of short-term loans and 77.2% of long-term loans were made under commitment (Board of Governors of the Federal Reserve System 1992).

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[1] Studies have also argued that the demand for these SLCs is related to signalling whereby good quality borrowers use SLCs to convey their type to investors (Kanatas 1987).

Funding Risk

In addition to the concern for the borrower's quality, pricing loan commitments requires knowledge of the cost of borrowing to meet commitments when exercised. A high level of loan commitments will result in high fee revenues but will also translate into a high expected level of funding obligations. As more guarantees are issued (presumably to increasingly more risky customers), the likelihood that the bank will have to fund more loans in the future also increases.[2] It is reasonable therefore, to assume that funding risk would be positively associated with loan commitment level.[3]

Funding risk is also influenced by the prevailing economic conditions. If the economy is experiencing a downturn, it is more likely that a large number of guarantees will have to be honored simultaneously. Also, liquidity guarantees are sensitive to interest rate changes. Increases in interest rates may result in large numbers of investors exercising options on municipal bonds that have the put feature, thus increasing the demand for funds promised under IRCs.[4]

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[2] A study by Deshmukh, Greenbaum, and Kanatas (1982) illustrates the role of funding risk associated with issuing contingent commitments. They model the bank as a writer of options with only indirect control over its loan supply and must manage liabilities in a costly funding environment. They show that loan commitment quantity varies (i) directly with the expected volume of deposits, (ii) inversely with volume uncertainty, (iii) directly with commitment fees and commitment interest rates, and (iv) inversely with deposit and purchased money interest rates.

[3] To some extent this depends upon the assumption that a firm's decisions about the amount of spot loans is independent of loans that arise from commitments that are taken down. If spot loan activity is not independent of commitments taken down, the relationship between loan commitment level and funding risk is not anticipated to be as strong. In this case funding risk does not become an issue until expected future loans from commitments exceed the projected optimal total lending limit.

[4] An historical example of the funding risk associated with IRCs occurred in 1970 when Penn Central went bankrupt. When they defaulted on their $82 million in commercial paper outstanding the commercial paper market temporarily "dried-up" and caused a liquidity crisis. Borrowers unrelated to Penn Central could not place their commercial paper and outstanding non-bank commercial paper dropped by $3 billion. A major liquidity crisis was averted when the Federal Reserve provided loans to banks, which were triple the level prior too Penn Central's failure (Calomiris 1989).

The cost of funding the exercised commitments (funding risk) is also a function of the maturity schedule of assets and liabilities. This relationship is largely tied to the degree of interest rate risk a bank faces when it must fund commitments. When a bank has a high level of net assets that will mature in the short run, it is in a better position to fund exercised commitments without having to liquidate earning assets. Banks may strategically mismatch their portfolios in order to accommodate future commitment takedowns.[5] This implies a positive relationship between net assets repricing in the short-term and the level of commitment activity.

In summary, the two predictions related to funding risk are as follows: (i) the more liquid the bank, the more easily it can absorb funding risk (e.g., cost), and hence, the higher the level of commitment activity; and (ii) the higher the degree of net assets repricing in the short run, the higher the probability that funds will be available to support exercised commitments and the higher the level of commitment activity.

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[5] Deshmukh, Greenbaum, and Kanatas (1983) present two alternative funding models of the bank. The "asset-transformer" maintains an inventory of funds by borrowing in advance of its needs. "Brokers" on the other hand, maintain maturity matched portfolios and face a higher degree of funding risk when commitments are exercised.

FDIC Insurance and the Moral Hazard Problem

The existence of fixed rate deposit insurance creates a moral hazard problem between bank stockholders and the FDIC. Increased risk taking results in wealth transfers from FDIC to equityholders. In the absence of risk-based insurance premia (or required capital ratios), there are incentives for banks to issue contingent commitments that effectively increase the risk of deposits (i.e. debt) and can increase the value of the insurance subsidy. That is, part of the increase in risk from issuing commitments is borne by the FDIC.[6] Therefore, the moral hazard hypothesis predicts that the riskier the bank, the greater the expected volume of loan commitments issued by the bank.

Risk-Based Capital

With risk-based capital, regulators formally recognized the riskiness of bank activities that do not appear in the body of the balance sheet to which earlier capital adequacy measures were restricted. Under risk-based capital, off-balance sheet activities are first converted to "balance sheet equivalents". Higher conversion factors are assigned to third party guarantees since they bear higher credit risk than other types of commitments. Risk weights are then applied to assets and off-balance sheet components based on general credit risk classifications. Higher risk weights are applied to higher risk activities, which translate into a higher capital requirement. This makes some types of off-balance sheet activities less profitable, particularly to capital constrained banks. The cost of carrying additional capital under the new regulations could be considered a "regulatory tax." Therefore, the introduction of risk-based capital requirements imposed a differential regulatory tax on different types of commitment activities.

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[6] In the presence of riskless debt there would be no incentive for banks to issue off-balance sheet commitments. This is due to the fact that any costs associated with the increase in risk would be fully borne by the stockholders.

Since TPGs have greater capital requirements than loan commitments, it is predicted that post-RBC, banks (particularly poorly capitalized banks) will issue fewer TPGs than pre-RBC. On the other hand, lower risk forms of contingent commitments (i.e. loan commitments) are expected to be issued in greater volumes. Prior to RBC, bank management appeared to prefer increasing risk due to the externalities associated with deposit insurance. Post-RBC, capital constrained firms are limited in their ability to increase credit risk, although firms that are not bound by capital restrictions would be expected to continue preferring taking on more risk.

Consequently, it is predicted that the regulatory tax imposed on TPGs post-RBC makes them less profitable for banks than other types of commitments. If TPGs and LCs are not substitutable forms of lending, we would expect to observe a decrease in TPGs and perhaps little or no effect on LC activity. Finally, in the post-RBC period firms with lower capital levels would be expected to be less aggressive in their TPG activities.

Macroeconomic Influence

The supply of commitments is also expected to be influenced by economic conditions. When the economic outlook is bleak, there is less demand for loans and loan commitments and bank customers are less likely to exercise existing loan commitments. Therefore, it is predicted that banks will issue more LCs, and customers will exercise more loan commitments under favorable economic conditions.

Data and Empirical Tests

The sample used in this study consists of 85 large bank holding companies (BHCs). While this sample constitutes a relatively small proportion of total banks, it is also the set of banks that conduct most of the banking industry's off-balance sheet activities.[7] The sample is partitioned into two portfolios based upon relative size (measured by average total assets). The large bank portfolio accounts for 91% of total assets, 98% of TPGs and 96% of LCs in the sample.

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[7] Chesson (1986) cites the following statistics, "Banks with assets greater than $3 billion account for 90% of all standby letters of credit, 84% of all commercial letters of credit, 83% of all loan commitments, and virtually all forward foreign exchange transactions"

The data for this study come from Federal Reserve quarterly Y-9 Reports for the period June 30, 1986, to December 31, 1991. This sample period allows for an examination of the impact of RBC regulation on contingent commitment activity. Quarterly reporting for holding companies began in the second quarter of 1986. Quarterly data of holding companies included in the sample met the following criteria: (i) stock prices were available from the CRSP NYSE or NASDQ files, and (ii) the bank was federally chartered so that Y-9 reports could be obtained. After deleting 17 banks with missing data for the post-RBC period 85 holding companies were retained in the sample, resulting in a balanced panel of 1955 firm-quarters.

Transitional RBC requirements were imposed starting year-end 1990 and final requirements were not fully in place until year-end 1992. During this period, required tier 1 capital was 3.625% of risk-weighted assets.[8] The period from the point of RBC adoption until December 31, 1989 was excluded from the sample to allow for portfolio adjustments by firms in response to the new requirements. In this study, the pre-RBC period includes observations from June 30, 1986, to June 30, 1988, and the post-RBC period begins on March 31, 1990.

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[8] U.S. bank regulators have defined 2 types of capital for banks. Tier 1 (or core) capital is defined as common stockholders' equity plus minority interest in consolidated subsidiaries minus goodwill. Supplementary capital consists of core capital plus portions of loan loss reserves, perpetual and long-term preferred stock, and subordinated debt.

Descriptive Statistics

Table 3-1 provides descriptive statistics for the sample. During the sample period total loan commitment activity (including standby letters of credit, commercial letters of credit, and loan commitments) for the sample firms has increased at an average annual rate of 24.7% while total assets increased at a rate of 14% during the same period. Figures 3-1, 3-2, and 3-3 show plots of total assets, total TPG and LC activity over the sample period.

Empirical Estimations

A measure of the intensity with which banks participate in commitment activities is calculated as the ratio of commitments (TPG or LC) to total assets and is denoted RTPG and RLC for each type, respectively.

The funding risk hypothesis predicts that commitment activity is positively related to the ability of the firm to fund expected commitments taken down with relatively low cost sources of funds. A liquidity proxy (LIQ) is used to capture the availability of low cost funds. Liquidity is defined by the IDC Financial Publishing Inc. liquidity formula as

> the sum of marketable securities maturing within five years, all floating rate securities, Federal Funds sold, securities purchased under agreements to resell, and interest-bearing balances due from depository institutions less all uninsured deposits and interest-bearing deposits in foreign offices, Edge and Agreement subsidiaries, and in IBFs as well as Federal Funds purchased, securities sold under agreement to repurchase and other borrowed money (1988, p 1).

One of the potential drawbacks of using this liquidity measure to capture funding risk is that it relies upon existing balance sheet measures of assets and liabilities. A more accurate measure would incorporate the banks' potential borrowing power (from depositors, the Federal Reserve's discount window, etc.) since there are alternative methods a bank may use to reduce the funding risk associated with contingent commitments. Holding a relatively liquid portfolio imposes some opportunity costs and may also reflect a lack of good investment opportunities for the bank.

Managing maturity composition is another way in which a firm can reduce its funding risk. This occurs through a reduction of costly borrowing by the bank and a reduction of interest rate risk. Therefore, funding risk is also predicted to be related to the degree of maturity matching of the balance sheet assets and liabilities. Since duration information is not disclosed, repricing data from the Y-9 report is used. The proxy for degree of maturity matching (GAP) is calculated as the difference between the total assets and total liabilities that reprice or mature within one year divided by total assets. This variable captures the extent to which a firm's balance sheet composition gives it the flexibility to fund contingencies. The relationships between the funding risk variables (LIQ and GAP) and contingent commitment intensity (RTPG and RLC) are expected to both be positive.

The intensity with which a bank is involved in contingent commitment activities is predicted to be positively related to asset risk according to the moral hazard hypothesis. The ratio of the allowance for loan and lease losses to total loans (RISK) is used as a proxy for the risk associated with a bank's balance sheet activities. The relationship between RISK and RTPC and RLC is predicted to be positive.

The moral hazard hypothesis also predicts that banks that are capital constrained will issue more contingent commitments. A relative measure of capital is used in this study. It is defined to be

$$\frac{\text{actual capital - required capital}}{\text{actual capital}} \quad . \tag{3.1}$$

Actual capital is defined to be the book value of common equity. Required capital differs between the pre-and post-RBC period. In the pre-RBC period required capital is 5.5 percent of total assets. In the post-RBC period, the required amount of capital varies according to the bank's portfolio of both on- and off-balance sheet activities.

Required capital under RBC is only available for the quarter ending December 31, 1991. Under RBC, each category of on- and off-balance sheet items is disaggregated into as many as six different risk-weighted categories to determine required capital. For example, the loan portfolio is broken down into high, medium, low, and zero credit risk groups with risk weights of 100% 50% 20% and 0%, respectively. This breakdown is only available for December 31, 1991. For the period from March 31, 1990, to September 30, 1991, only the total loans outstanding is disclosed. The data for December 31, 1991, are used to estimate the weights given to on- and off-balance sheet components in the following three regression models:

$$\text{RWBS} = \alpha_0 + \alpha_1 \text{ LOANS} + \mu_{2a}, \tag{3.2a}$$

$$\text{RWOBS1} = \alpha_0 + \alpha_1 \text{ SLC} + \alpha_2 \text{ LC} + \alpha_3 \text{ GCPCH} + \mu_{2b}, \tag{3.2b}$$

$$\begin{aligned} \text{RWOBS2} = {} & \alpha_0 + \alpha_1 \text{ FEXCP} + \alpha_2 \text{ FEXPOPT} \\ & + \alpha_3 \text{ FEXSWP} + \alpha_4 \text{ FEXWOPT} \\ & + \alpha_5 \text{ FUTFWD} + \alpha_6 \text{ PCHOPT} \\ & + \alpha_7 \text{ SWAPS} + \alpha_8 \text{ WROPT} + \mu_{2c}, \end{aligned} \tag{3.2c}$$

where

RWBS = risk-weighted balance sheet components,
RWOBS1 = risk-weighted off-balance sheet commitments,
RWOBS2 = risk-weighted other off-balance sheet activities,
LOANS = loans outstanding,
SLC = standby letters of credit,
LC = loan commitments,
GCPCH = gross commitments to purchase,
FEXCP = foreign exchange commitments to purchase,
FEXPOPT = foreign exchange purchase options,
FEXSWP = foreign exchange swaps,
FEXWOPT = foreign exchange options,

FUTFWD = futures and forward contracts,
PCHOPT = purchased options,
SWAPS = swaps, and
WROPT = written options.

Actual RBC data are used as the dependent variables and broad classifications of on- and off-balance sheet components are used as the independent variables for December 31, 1991. The three equations are estimated for small and large banks independently. Coefficient estimates from these equations are used to approximate the weights for each of the components of required RBC. That is, for the period March 31, 1990, to September 30, 1991,

$$\widehat{RWBS} = \hat{\alpha}_0 + \hat{\alpha}_1 \, LOANS \qquad (3.3a)$$

$$\widehat{RWOBS1} = \hat{\alpha}_0 + \hat{\alpha}_1 \, SLC + \hat{\alpha}_2 \, LC + \hat{\alpha}_3 \, GCPCH \qquad (3.3b)$$

$$\begin{aligned} \widehat{RWOBS2} = \hat{\alpha}_0 &+ \hat{\alpha}_1 \, FEXCP + \hat{\alpha}_2 \, FEXPOPT + \hat{\alpha}_3 \, FEXSWP \qquad (3.3c) \\ &+ \hat{\alpha}_4 \, FEXWOPT + \hat{\alpha}_5 \, FUTFWD + \hat{\alpha}_6 \, PCHOPT \\ &+ \hat{\alpha}_7 \, SWAPS + \hat{\alpha}_8 \, WROPT \end{aligned}$$

Total estimated risk-weighted assets (RWA) is the sum of the three components,

$$\widehat{RWA} = \widehat{RWBS} + \widehat{RWOBS1} + \widehat{RWOBS2} \, . \qquad (3.4)$$

Finally, the estimated required tier 1 capital for each bank during this period is

$$\text{Required Capital} = 3.625\% \times \widehat{RWA} \, , \qquad (3.5)$$

where 3.625% is the percentage of risk-weighted assets that banks are required to hold as capital. The capital constraint variable is estimated using equation 3.1. RBC requirements are expected to reduce the incentives for firms to engage in third party guarantees due to the higher level of capital required for these agreements relative to loan commitments. The disincentive to use TPGs (and LCs) should be greatest for banks with low levels of required capital.

A dummy variable (REG) is created for the two regulatory regimes and slope shifts are permitted for each of the independent variables across the two regimes. The variable REG equals zero for the pre-RBC period and one in the post-RBC period. The coefficient on REG*CAP is expected to be positive. This would imply that banks with higher capital levels are in a better position to issue more commitments after RBC rules are instituted.

A composite leading indicator issued by the U.S. Department of Commerce is used to capture the economic environment. This indicator (LEAD) is designed to track turning points in the business cycle. LEAD is expected to be positively related to contingent commitment intensity since banks will tend to issue more commitments when the economic outlook is favorable. This variable is expected to be more reflective of the environment in which the large banks are operating.

A variable capturing the extent of loan activity (relative to total assets) is included in the model. This is done to examine the extent to which off-balance sheet loan activity is related to loans that are issued and appear on the balance sheet.

The following empirical model is estimated using panel data analysis:

$$\begin{aligned}\text{RTPG(RLC)} = {} & \alpha_{0i} + \alpha_1 \text{ TASST} + \alpha_2 \text{ LIQ} + \alpha_3 \text{ CAP} \\ & + \alpha_4 \text{ GAP} + \alpha_5 \text{ RISK} + \alpha_6 \text{ LOAN} + \alpha_7 \text{ LEAD} \\ & + \alpha_8 \text{ REG} + \alpha_9 \text{ REG*TASST} + \alpha_{10} \text{ REG*LIQ} \\ & + \alpha_{11} \text{ REG*CAP} + \alpha_{12} \text{ REG*GAP} + \alpha_{12} \text{ REG*LOAN} \\ & + \alpha_{14} \text{ REG*RISK} + \mu_6. \end{aligned} \tag{3.6}$$

Variable definitions are summarized in Table 3-1. A fixed-effects model is estimated which allows for firm-specific intercept shifts. One of the potential benefits of allowing firm-specific intercept shifts is that if the intercept captures the effects of correlated omitted variables the bias in the slope coefficients are reduced.[9] Due to the problems with serial correlation and heteroscedasticity in the error term Newey-West (cited in Greene 1993) standard errors are reported. This procedure is discussed further in Appendix B.

To summarize, the hypothesized relationships between the intensity of contingent commitment activity (RTPG and

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[9] See Beaver, Eger, Ryan, and Wolfson (1990) for a discussion of the fixed-effects model.

RLC) and economic determinants that are examined in the above model are as follows.

Funding risk:

The funding risk variables LIQ and GAP are expected to be positively related to RTPG and RLC since firms with lower funding risk (higher LIQ and GAP) are better able to fund a higher level of contingent commitments that are exercised.

Moral hazard:

The proxies for the extent to which banks face a moral hazard problem, RISK (CAP) are positively (negatively) related to RTPG and RLC since risky firms are more inclined to maximize the value of the FDIC insurance subsidy by increasing risk through the issuance of contingent commitments.

Risk-based capital:

The coefficient on CAP*REG is negative since RBC rules impose costs on poorly capitalized banks that take on high levels of contingent commitments. REG represents an intercept shift and is expected to have a negative coefficient reflecting a reduction in the intensity of TPG and LC activity in the post-RBC period.

Economic environment:

LEAD is positively related to RLC reflecting banks' desire to lend under favorable economic conditions.

Results

This section begins with a discussion of the effects of RBC requirements on the two types of loan commitments (RTPG and RLC). Next, descriptive statistics are briefly discussed. The results of estimating required capital for the post-RBC period are presented then the results of estimating the multiple regression models given in equation 3.6 are presented.

Risk-Based Capital Requirements and Loan Commitment Activity

The impact of RBC requirements can be seen graphically in Figures 3-4 and 3-5 which illustrate the pattern of TPG and LC intensity over the sample period. Third party guarantee intensity shows a slight decline throughout the sample period while LC intensity shows a slight increase (most notably after RBC rules took affect). These patterns are also exhibited within each size classification.

Figure 3-6 illustrates the relative mix of TPGs and LCs over the sample period. Loan commitments represent a larger proportion of total commitment activity, which also increases over time. This is consistent with the expectation that RBC rules discourages the more heavily taxed TPG activities. Firms appear to have shifted away from the types of commitments that carry heavier risk weights and into the lower risk-weight activities. The observed pattern is also consistent with the idea that growth in LCs complements growth in assets.

Univariate Statistics

The descriptive statistics for the partitioned sample are given in Table 3-2. The mean size of the large bank portfolio is 10 times the mean size of small banks; the mean level of third party guarantees is 51.2 times greater; and mean level of loan commitments is 21.1 times greater. Within the sample, for the large BHCs loan commitments average 22.3% of total assets and only 11.3% of total assets for the small banks. The composition of loan commitment activity also differs substantially between the groups. Third party guarantees represent 25.2% of all loan commitment activity for large banks and 12.2% for small banks. This may reflect a comparative advantage of larger banks in underwriting risk through cost or risk diversification synergies. Correlations between the independent variables for the two size partitions are given in Table 3-3.

Estimated Required Risk-Based Capital

The parameter estimates from equations 3.2a, 3.2b, and 3.2c were used to calculate required risk-based capital for the six quarters prior to public disclosure of RBC data. The models were estimated separately for the small and large bank groups and the results are reported in Tables 3-4, 3-5, and 3-6. As normally the case, loans are the primary source of credit risk from balance sheet activities. The coefficient on LOANS in Table 3-4 is close to one for both size groups and the R^2 values are close to one. The explanatory power of the off-balance sheet models is significantly higher for the large banks. For the large banks, the R^2 value is 98.8% and is only 18% for small banks. The coefficient on standby letters of credit is significantly higher than the coefficient on loan commitments for both groups, which is consistent with expectations that TPGs are much more taxed under RBC rules than LCs.

Multiple Regression Model for Third Party Guarantees

Table 3-7 presents the results of examining the determinants of third party guarantees for all banks. The results are given in Table 3-9 for large banks and Table 3-11 for small banks.

The level of loan activity relative to total assets (LOAN) is positively related to the intensity of third party guarantees (RTPG) under all sample partitions. This suggests that third party guarantees are not substitutes for bank loans. Banks may provide financial guarantees to maintain ongoing relationships with good customers.

The coefficient on the LOAN*REG interactive variable is negative. This indicates that in the post-RBC period, banks with a higher proportion of loans in their asset portfolio had less third party guarantees outstanding relative to the pre-RBC period. Table 3-8 provides the parameter estimates for the post-RBC period and the associated Newey-West (cited in Greene 1993) standard errors. In the post-RBC period the association between loan intensity and third party guarantees continues to be positive and significant. Therefore, despite the increased capital requirements for third party guarantees, banks that are more active in lending continue to issue more TPGs relative to less aggressive lenders.

The moral hazard hypothesis predicts that riskier banks issue more third party guarantees in the absence of regulatory intervention. Consistent with this hypothesis, the coefficient on the asset risk variable (RISK) is positive and significant in Table 3-7. Since risk-based capital rules were designed to require riskier banks to hold more capital, it is expected that in the post-RBC period banks with relatively higher risk would be more constrained in their activities. The coefficient on the risk interactive variable (RISK*REG) is negative in Table 3-7. This is consistent with the contention that risk-based capital rules reduced the propensity for more risky banks to issue large amounts of third party guarantees. In the post-RBC period, the relationship between RTPG and RISK continues to be positive as shown in Table 3-8.

The capital variable (CAP) is not significantly related to third party guarantees in the pre-RBC period. However, the capital interactive variable (CAP*REG) is positive, indicating that in the post-RBC period less capital constrained banks issued more TPGs relative to the pre-RBC period. This finding is not surprising since risk-based capital rules made these off-balance sheet activities less lucrative, particularly to capital constrained banks. The relationship between CAP and RTPG is positive and significant in the post-RBC period, as shown in Table 3-8.

The two funding risk variables are not significant in explaining RTPG in the pre-RBC period. However, in the post-RBC period the liquidity variable (LIQ) is negative for all sample partitions. This is illustrated in Tables 3-8, 3-10, and 3-12. This finding is not consistent with the funding risk hypothesis, which posits that more liquid banks would choose to issue more TPGs. The negative relationship suggests that it is sub-optimal for banks to maintain high levels of liquidity to fund its contingent commitments. The other funding risk variable (GAP) is negatively related to RTPG in the post-RBC period. This is inconsistent with expectations and suggests that this variable is picking up other effects.

The leading economic indicator (LEAD) is not significantly related to RTPG. A possible explanation for this is that there exist frictions that limit the ability of banks to rapidly change their levels of TPGs in response to changes in the economy. Further examination of changes in the levels of TPG is required to assess the way in which changes in the economy affect TPGs outstanding.

The regression model was also estimated for large and small bank partitions. The results are generally consistent across size groups with the exception of the capital variable. For small banks CAP is insignificant and has the wrong sign. A probable explanation for this is that the CAP estimates are less precise for the small bank group. As indicated earlier, the R^2 values for the off-balance sheet components of risk-based capital are 18% and 59% for the small banks compared with 98.8% and 98.8% for the large banks.

The coefficient on the regulatory shift variable (REG) is negative and significant for all size partitions. This coefficient indicates that there is a downward shift for the post-RBC period but it does not necessarily represent a decrease in RTPG. To examine whether the level of TPG decreased for the average bank the parameter estimates for the regulatory shift variables were multiplied by the post-

RBC mean values for each variable. The change in RTPG for the average bank was

$$
\begin{aligned}
\Delta \widehat{\mathrm{RTPG}} = {} & \hat{\alpha}_8 \, \mathrm{REG} + \hat{\alpha}_9 \, \overline{\mathrm{TA}} + \hat{\alpha}_{10} \, \overline{\mathrm{LIQ}} \\
& + \hat{\alpha}_{11} \, \overline{\mathrm{CAP}} + \hat{\alpha}_{12} \, \overline{\mathrm{GAP}} + \hat{\alpha}_{13} \, \overline{\mathrm{LOAN}} \\
& + \hat{\alpha}_{14} \, \overline{\mathrm{RISK}} + \hat{\alpha}_{15} \, \overline{\mathrm{LEAD}}.
\end{aligned}
\tag{3.7}
$$

For the average large bank RTPG increased by 0.16 percent and for the average small bank RTPG decreased by 0.27 percent. This indicates that while risk-based capital requirements reduced TPG activity for poorly capitalized banks they do not appear to have reduced TPG relative to total assets for the average large bank.

Multiple Regression Model for Loan Commitments

Table 3-13 presents the results of examining the determinants of loan commitment activity. The positive coefficient on LOAN indicates that banks that have a higher proportion of loans in their asset portfolio also tend to have more loan commitments outstanding. This is consistent with the belief that loan commitments are essentially future loan agreements and complement lending activity. Banks that have an aggressive lending strategy issue more LCs to generate loans in the future. This positive relationship continues to exist in the post-RBC period as reported in Table 3-14.

In the post-RBC period riskier banks tend to have lower relative levels of loan commitments outstanding. The coefficient on RISK*REG is negative as shown in Table 3-14.

The coefficient on RISK is negative in the post-RBC period (Table 3-14). This result is consistent with expectations that loan commitment activity is less lucrative for higher risk banks in the post-RBC period.

Table 3-14 illustrates that capital is positively related to RLC in the post-RBC period. However, neither the capital shift variable (CAP*REG), nor the pre-RBC capital variable is significantly different from zero in Table 3-13. The positive coefficient on CAP indicates that higher capital firms tend to have more LCs outstanding in the post-RBC period relative to less well capitalized banks.

Tables 3-15 and 3-17 give the results of estimating the model by size groups. The results are consistent with the full sample estimation. The variable LEAD is positively related to RLC in the post-RBC period for both small and large bank groups. This is consistent with the belief that economic conditions affect the level of loan commitments outstanding. This hypothesis requires further investigation using a longer time series of data.

The coefficients on the funding risk variables are not consistent with expectations, indicating that they may be picking up other effects.

To determine whether the relative level of loan commitments decreased on average in the post-RBC period the regulatory shift coefficients are multiplied by the average levels of the independent variables. The change in RLC for the average bank is estimated to be

$$\begin{aligned}\Delta \mathrm{R\hat{L}C} = \hat{\alpha}_8\, \mathrm{REG} + \hat{\alpha}_9\, \overline{\mathrm{TA}} + \hat{\alpha}_{10}\, \overline{\mathrm{LIQ}} \\ + \hat{\alpha}_{11}\, \overline{\mathrm{CAP}} + \hat{\alpha}_{12}\, \overline{\mathrm{GAP}} + \hat{\alpha}_{13}\, \overline{\mathrm{LOAN}} \\ + \hat{\alpha}_{14}\, \overline{\mathrm{RISK}} + \hat{\alpha}_{15}\, \overline{\mathrm{LEAD}}.\end{aligned} \tag{3.8}$$

For small banks the change in RLC is 1.67% of total assets and for large banks this value is 3.56%. This suggests that risk-based capital requirements did not result in decreased loan commitment activity.

Summary

The analysis in this chapter provides evidence consistent with the belief that moral hazard, and risk-based capital considerations influence the supply of contingent commitments by banks. It also appears that off-balance sheet intensity sheds light on bank lending strategy, and is related to the intensity of balance sheet lending. In general, higher risk firms issue more contingent commitments, but risk-based capital requirements reduced the contingent commitment activity of riskier banks. In addition, banks that are more capitalized were more actively involved in off-balance sheet banking in the post-RBC period. It appears that the differential regulatory tax has changed the composition of overall loan commitment activity. Loan commitment activity for the average bank increased more than third party guarantees after RBC requirements were in place. These results have important implications in the valuation issue relating to the disclosures on these activities. Specifically, if banks use commitment activities to increase risk beyond that reflected in the financial statements, nominal disclosures of contingent commitment activity levels should provide important signals for valuation.

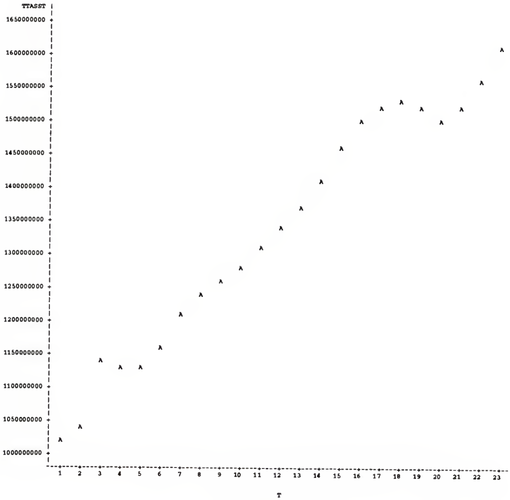

FIGURE 3-1

PLOT OF TOTAL ASSETS OVER TIME

Horizontal axis: quarterly time periods
1=June 30, 1986; 23=December 31, 1991
Vertical axis: total assets in thousands of dollars

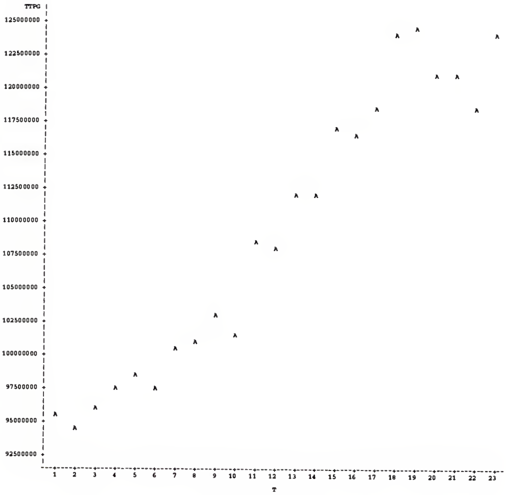

FIGURE 3-2

PLOT OF TOTAL THIRD PARTY GUARANTEES OVER TIME

Horizontal axis: quarterly time periods
1=June 30, 1986; 23=December 31, 1991
Vertical axis: total third party guarantees in thousands of dollars

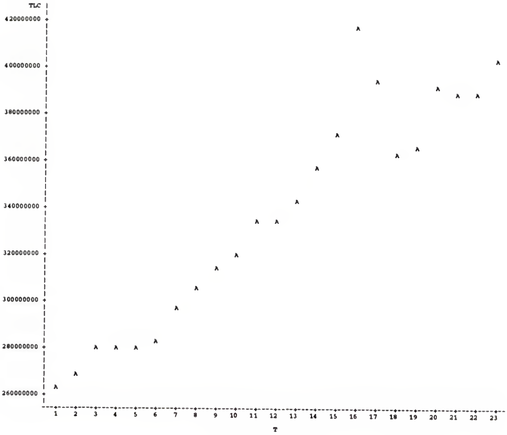

FIGURE 3-3

PLOT OF TOTAL LOAN COMMITMENTS OVER TIME

Horizontal axis: quarterly time periods
1=June 30, 1986; 23=December 31, 1991
Vertical axis: total loan commitments in thousands of dollars

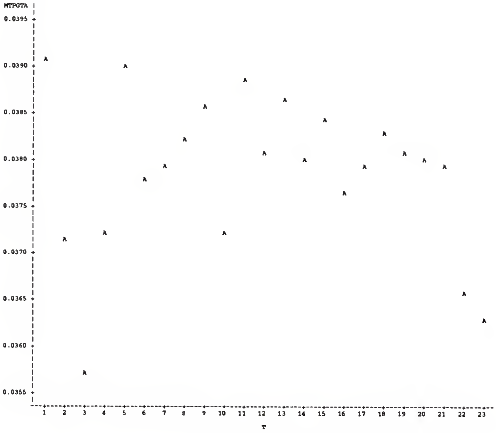

FIGURE 3-4

PLOT OF THIRD PARTY GUARANTEE INTENSITY OVER TIME

Horizontal axis: quarterly time periods
1=June 30, 1986; 23=December 31, 1991
Vertical axis: average of third party guarantees divided by total assets

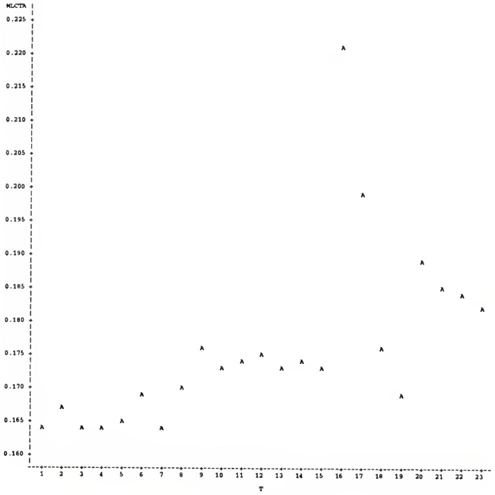

FIGURE 3-5

PLOT OF LOAN COMMITMENT INTENSITY OVER TIME

Horizontal axis: quarterly time periods
1=June 30, 1986; 23=December 31, 1991
Vertical axis: average of loan commitments divided by total assets

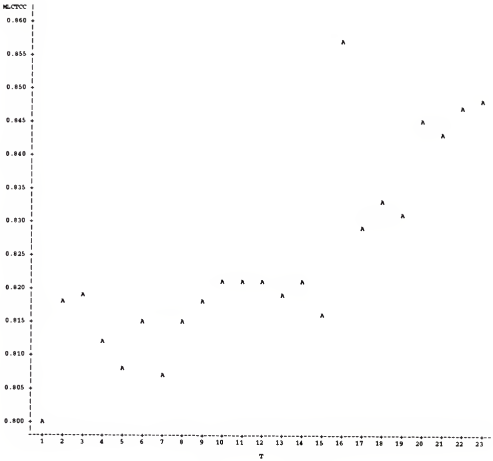

FIGURE 3-6

PLOT OF TOTAL LOAN COMMITMENTS RELATIVE TO TOTAL CONTINGENT COMMITMENTS OVER TIME

Horizontal axis: quarterly time periods
1=June 30, 1986; 23=December 31, 1991
Vertical axis: average of loan commitments divided by total contingent commitments

TABLE 3-1

Variable Definitions and Regression Equations

RTPG = Third Party Guarantees (standby and commercial letters of credit) divided by total assets,
RLC = Loan Commitments divided by total assets,
TA = Total assets,
GAP = Assets maturing or repricing within one year less liabilities maturing or repricing within one year ÷ total assets,
LIQ = Liquidity ÷ Total assets,
CAP = Book value of equity ÷ Total assets (Core Capital),
LOAN = Total loans ÷ Total assets,
RISK = Allowance for Loan and Lease Losses divided by total loans,
REG = Regulatory regime (REG=0 for pre-RBC period; REG=1 for post-RBC period),
LEAD = Leading economic indicator,
RWBS = risk-weighted balance sheet components,
RWOBS1 = risk-weighted off-balance sheet commitments,
RWOBS2 = risk-weighted other off-balance sheet activities,
LOANS = loans outstanding,
SLC = standby letters of credit,
LC = loan commitments,
GCPCH = gross commitments to purchase,
FEXCP = foreign exchange commitments to purchase,
FEXPOPT = foreign exchange purchase options,
FEXSWP = foreign exchange swaps,
FEXWOPT = foreign exchange options,
FUTFWD = futures and forward contracts,
PCHOPT = purchased options,
SWAPS = swaps,
WROPT = written options,
INT = intercept.

Regression Equations (3.6):

$$\begin{aligned} \text{RTPG} = \; & \alpha_{0i} + \alpha_1 \text{ TA} + \alpha_2 \text{ LIQ} + \alpha_3 \text{ CAP} + \alpha_4 \text{ GAP} + \alpha_5 \text{ LOAN} + \alpha_6 \text{ RISK} \\ & + \alpha_7 \text{ LEAD} + \alpha_8 \text{ REG} + \alpha_9 \text{ TA*REG} + \alpha_{10} \text{ LIQ*REG} + \alpha_{11} \text{ CAP*REG} \\ & + \alpha_{12} \text{ GAP*REG} + \alpha_{13} \text{ LOAN*REG} + \alpha_{14} \text{ RISK*REG} + \alpha_{15} \text{ LEAD*REG} + \mu_{6a} \end{aligned}$$

$$\begin{aligned} \text{RLC} = \; & \alpha_{0i} + \alpha_1 \text{ TA} + \alpha_2 \text{ LIQ} + \alpha_3 \text{ CAP} + \alpha_4 \text{ GAP} + \alpha_5 \text{ LOAN} + \alpha_6 \text{ RISK} \\ & + \alpha_7 \text{ LEAD} + \alpha_8 \text{ REG} + \alpha_9 \text{ TA*REG} + \alpha_{10} \text{ LIQ*REG} + \alpha_{11} \text{ CAP*REG} \\ & + \alpha_{12} \text{ GAP*REG} + \alpha_{13} \text{ LOAN*REG} + \alpha_{14} \text{ RISK*REG} + \alpha_{15} \text{ LEAD*REG} + \mu_{6b} \end{aligned}$$

TABLE 3-2

Descriptive Statistics

Small Banks

	N	MEAN	S.D.	MIN	MAX
TPG[a]	570	44549	39512	0	258534
LC	570	320575	304005	0	2652073
TA	570	2581313	1092465	796452	6510554
RTPG	570	0.01613	0.010435	0	0.06669
RLC	570	0.11329	0.065936	0	0.479243
LIQ	570	0.14443	0.09138	-0.123957	0.409239
CAP	570	0.41454	0.191416	0.017798	0.831905
GAP	570	0.162337	0.120949	0.000727	0.518281
LOAN	570	0.598681	0.08788	0.300756	0.773063
RISK	570	0.01630	0.008478	0.007292	0.079487

Large Banks

	N	MEAN	S.D.	MIN	MAX
TPG	705	2279465	5009363	39150	35178000
LC	705	6763177	9802888	13986	60709000
TA	705	26033774	34446053	2594190	227752000
RTPG	705	0.055082	0.036397	0.006427	0.172808
RLC	705	0.223264	0.117241	0.000375	0.731626
LIQ	705	0.028496	0.107155	-0.194406	0.425960
CAP	705	0.344993	0.168266	-0.12476	0.867673
GAP	705	0.191027	0.105498	0.000297	0.548973
LOAN	705	0.632413	0.099824	0.126630	0.870463
RISK	705	0.021610	0.011611	0.007223	0.075442

[a] Variable definitions are detailed in Table 3-1.

TABLE 3-3

Correlations between Independent variables

Small Banks

	LIQ	CAP	GAP	LOAN	RISK
LIQ[a] p	1.00000 0.0	-0.00013 0.9746	-0.08221 0.0498	-0.51166 0.0001	-0.02593 0.5367
CAP p	-0.00013 0.9746	1.00000 0.0	-0.23776 0.0001	-0.03549 0.3977	0.15043 0.0003
GAP p	-0.08221 0.0498	-0.23776 0.0001	1.00000 0.0	0.03491 0.4054	0.01906 0.6497
LOAN t	-0.51166 0.0001	-0.03549 0.3977	0.03491 0.4054	1.00000 0.0	-0.32601 0.0001
RISK p	-0.02593 0.5367	0.15043 0.0003	0.01906 0.6497	-0.32601 0.0001	1.00000 0.0

Large Banks

	LIQ	CAP	GAP	LOAN	RISK
LIQ p	1.00000 0.0	0.16420 0.0001	0.10902 0.0038	-0.42514 0.0001	-0.17641 0.0001
CAP p	0.16420 0.0001	1.00000 0.0	-0.02181 0.5632	-0.22250 0.0001	0.09822 0.0091
CAP p	0.10902 0.0038	-0.02181 0.5632	1.00000 0.0	-0.12868 0.0006	-0.10232 0.0065
LOAN t	-0.42514 0.0001	-0.22250 0.0001	-0.12868 0.0006	1.00000 0.0	-0.14442 0.0001
RISK p	-0.17641 0.0001	0.09822 0.0091	-0.10232 0.0065	-0.14442 0.0001	1.00000 0.0

[a] Variable definitions are detailed in Table 3-1.

TABLE 3-4

Risk-Based Capital Estimation: BALANCE SHEET ASSETS

Regressions for 12/31/91

$$RWBS = \alpha_0 + \alpha_1 \text{ LOANS} + \mu_{2a}$$

	SMALL	LARGE
N	40	47
INT[a] t	16729[b] 3.13	521276 0.82
LOANS t	0.982[b] 38.72	1.072[b] 56.86
Adj-R^2	0.974	0.986

[a] Variable definitions are detailed in Table 3-1.

[b] Significant at the 95% level for a one-tailed t-test using Newey-West standard errors.

TABLE 3-5

Risk-Based Capital Estimates:
OFF-BALANCE SHEET COMMITMENTS

Regressions for 12/31/91

$$RWOBS1 = \alpha_0 + \alpha_1 \ SLC + \alpha_2 \ LC + \alpha_3 \ GCPCH + \mu_{2b}$$

	SMALL	LARGE
N	40	47
INT[a] t	24902 1.20	-190685 -1.31
SLC t	0.756 1.41	1.052[b] 18.74
LC t	0.049 0.77	0.133[b] 5.29
GCPCH t	0.177 0.23	1.742[b] 3.04
Adj-R^2	0.180	0.988

[a] Variable definitions are detailed in Table 3-1.

[b] Significant at the 95% level for a one-tailed t-test using Newey-West standard errors.

TABLE 3-6

Risk-Based Capital Estimates: OTHER OFF-BALANCE SHEET ACTIVITIES

Regressions for 12/31/91

$$RWOBS2 = \alpha_0 + \alpha_1 \text{ FEXCP} + \alpha_2 \text{ FEXPOPT} + \alpha_3 \text{ FEXSWP} + \alpha_4 \text{ FEXOPT} + \alpha_5 \text{ FUTFWD} + \alpha_6 \text{ PCHOPT} + \alpha_7 \text{ SWAPS} + \alpha_8 \text{ WROPT} + \mu_{2c}$$

	SMALL	LARGE
N	40	47
INT[a] t	107.44 0.54	14273[b] 2.08
FEXCP t	0.003 0.157	0.001 1.10
FEXPOPT t	-0.822 -0.10	0.347[b] 4.83
FEXSWP t	-12.12 -1.72	0.041[b] 23.52
FEXWOPT t	c	-0.304[b] -4.62
FUTFWD t	-0.013 -1.65	-0.006[b] -8.66
PCHOPT t	-0.001 -0.34	0.002 0.31
SWAPS t	0.009[b] 7.84	0.007[b] 4.61
WROPT t	0.002 0.20	0.020[b] 2.60
Adj-R^2	0.593	0.988

[a] Variable definitions are detailed in Table 3-1.

[b] Significant at the 95% level for a one-tailed t-test using Newey-West standard errors.

[c] Almost none of the small banks in the sample reported values for FEXWOPT

TABLE 3-7

Economic Determinants of Third Party Guarantees

Sample of all 85 bank holding companies
(N=1275)

$$RTPG = \alpha_{0i} + \alpha_1 TA + \alpha_2 LIQ + \alpha_3 CAP + \alpha_4 GAP + \alpha_5 LOAN + \alpha_6 RISK + \alpha_7 LEAD + \alpha_8 REG + \alpha_9 TA{*}REG + \alpha_{10} LIQ{*}REG + \alpha_{11} CAP{*}REG + \alpha_{12} GAP{*}REG + \alpha_{13} LOAN{*}REG + \alpha_{14} RISK{*}REG + \alpha_{15} LEAD{*}REG + \mu_{6a}.$$

ADJ R^3 = 0.146

	Parameter Estimate	O.L.S. S.E.	White's S.E.	Newey-West S.E.
TA[a]	-3.79E-11	5.91E-11	8.24E-11	1.12E-10
LIQ	9.83E-3	5.30E-3	5.71E-3	2.58E-2
CAP	4.85E-3	3.89E-3	3.80E-3	5.90E-3
GAP	-7.56E-4	3.89E-3	3.32E-3	5.90E-3
LOAN	0.077[b]	6.56E-3	8.12E-3	1.26E-2
RISK	0.182[b]	4.47E-2	5.78E-2	9.89E-2
LEAD	-2.45E-4	7.66E-5	8.45E-5	0.159
REG	-0.015[c]	0.022	0.022	9.28E-3
TA*REG	1.21E-11	1.85E-11	2.42E-11	3.59E-11
LIQ*REG	-2.90E-2	5.04E-3	5.75E-3	2.58E-2
CAP*REG	-1.83E-3	3.97E-3	4.05E-3	6.23E-3
GAP*REG	-1.14E-2	3.09E-3	3.71E-3	1.06E-2
LOAN*REG	-2.58E-2[b]	5.80E-3	7.41E-3	1.22E-2
RISK*REG	-0.123[c]	0.052	0.060	0.097
LEAD*REG	2.60E-4	1.53E-4	1.48E-4	0.160

[a] Variable definitions are detailed in Table 3-1.

[b] Significant at the 95% level for a one-tailed t-test using Newey-West standard errors.

[c] Significant at the 90% level for a one-tailed t-test using Newey-West standard errors.

TABLE 3-8

THIRD PARTY GUARANTEES

Post Risk-Based Capital Period
Coefficient Estimates
Sample of all 85 bank holding companies
(N=1275)

$$\begin{aligned} RTPG = {} & \alpha_{0i} + \alpha_1\,TA + \alpha_2\,LIQ + \alpha_3\,CAP + \alpha_4\,GAP + \alpha_5\,LOAN \\ & + \alpha_6\,RISK + \alpha_7\,LEAD + \alpha_8\,REG + \alpha_9\,TA{*}REG \\ & + \alpha_{10}\,LIQ{*}REG + \alpha_{11}\,CAP{*}REG + \alpha_{12}\,GAP{*}REG \\ & + \alpha_{13}\,LOAN{*}REG + \alpha_{14}\,RISK{*}REG + \alpha_{15}\,LEAD{*}REG + \mu_{6a}. \end{aligned}$$

$$\alpha = (\alpha_m + \alpha_n).$$

$$var(\alpha_m + \alpha_n) = var(\alpha_m) + var(\alpha_n) + 2\,cov(\alpha_m, \alpha_n).$$

	Parameter Estimate	Newey-West S.E.
TA[a] $\alpha_1+\alpha_9$	-2.58E-11	9.00E-11
LIQ $\alpha_2+\alpha_{10}$	-1.92E-2[b]	1.13E-2
CAP $\alpha_3+\alpha_{11}$	3.01E-3[c]	1.90E-3
GAP $\alpha_4+\alpha_{12}$	-1.21E-2[b]	6.94E-3
LOAN $\alpha_5+\alpha_{13}$	5.10E-2[b]	8.28E-3
RISK $\alpha_6+\alpha_{14}$	5.89E-2[c]	4.29E-2
LEAD $\alpha_7+\alpha_{15}$	1.50E-5	3.45E-2

[a] Variable definitions are detailed in Table 3-1.

[b] Significant at the 95% level for a one-tailed t-test using Newey-West standard errors.

[c] Significant at the 90% level for a one-tailed t-test using Newey-West standard errors.

TABLE 3-9

Economic Determinants of Third Party Guarantees

Sample of 47 large bank holding companies
(N=705)

$$\begin{aligned} RTPG = {} & \alpha_{0i} + \alpha_1 \, TA + \alpha_2 \, LIQ + \alpha_3 \, CAP + \alpha_4 \, GAP + \alpha_5 \, LOAN + \alpha_6 \, RISK \\ & + \alpha_7 \, LEAD + \alpha_8 \, REG + \alpha_9 \, TA{*}REG + \alpha_{10} \, LIQ{*}REG \\ & + \alpha_{11} \, CAP{*}REG + \alpha_{12} \, GAP{*}REG + \alpha_{13} \, LOAN{*}REG \\ & + \alpha_{14} \, RISK{*}REG + \alpha_{15} \, LEAD{*}REG + \mu_{6a}. \end{aligned}$$

$ADJ \ R^2 = 0.169$

	Parameter Estimate	O.L.S. S.E.	White's S.E.	Newey-West S.E.
TA[a]	-5.43E-11	7.36E-11	2.63E-11	9.97E-11
LIQ	0.015	7.73E-3	9.21E-3	1.22E-2
CAP	0.013	7.50E-3	7.62E-3	1.12E-2
GAP	-2.69E-3	5.69E-3	5.61E-3	9.09E-3
LOAN	0.110[b]	1.03E-2	1.20E-2	1.44E-2
RISK	6.17E-2	6.98E-2	8.40E-2	5.23E-2
LEAD	-2.33E-4	1.30E-4	1.35E-4	0.123
REG	-1.18E-2[b]	3.55E-2	3.37E-2	3.35E-4
TA*REG	-4.37E-12	2.37E-11	2.63E-11	3.68E-11
LIQ*REG	-0.033[b]	7.73E-3	8.11E-3	1.16E-2
CAP*REG	-6.13E-3	7.33E-3	7.47E-3	1.07E-2
GAP*REG	-3.06E-2[b]	7.73E-3	7.25E-3	1.00E-2
LOAN*REG	-4.83E-2[b]	8.73E-3	1.06E-2	1.47E-2
RISK*REG	-1.15E-2	7.81E-2	8.48E-2	1.20E-1
LEAD*REG	3.50E-4	2.45E-4	2.31E-4	3.69E-4

[a] Variable definitions are detailed in Table 3-1.

[b] Significant at the 95% level for a one-tailed t-test using Newey-West standard errors.

TABLE 3-10

THIRD PARTY GUARANTEES

Post Risk-Based Capital Period
Coefficient Estimates
Sample of 47 large bank holding companies
(N=705)

$$RTPG = \alpha_{0i} + \alpha_1\ TA + \alpha_2\ LIQ + \alpha_3\ CAP + \alpha_4\ GAP + \alpha_5\ LOAN + \alpha_6\ RISK + \alpha_7\ LEAD + \alpha_8\ REG + \alpha_9\ TA{*}REG + \alpha_{10}\ LIQ{*}REG + \alpha_{11}\ CAP{*}REG + \alpha_{12}\ GAP{*}REG + \alpha_{13}\ LOAN{*}REG + \alpha_{14}\ RISK{*}REG + \alpha_{15}\ LEAD{*}REG + \mu_{6a}.$$

$$\alpha = (\alpha_m + \alpha_n)$$

$$var(\alpha_m + \alpha_n) = var(\alpha_m) + var(\alpha_n) + 2\ cov(\alpha_m, \alpha_n)$$

	Parameter Estimate	Newey-West S.E.
TA[a] $\alpha_1+\alpha_9$	-5.87E-11	7.69E-11
LIQ $\alpha_2+\alpha_{10}$	-1.77E-2[b]	8.38E-3
CAP $\alpha_3+\alpha_{11}$	1.29E-2[b]	2.66E-3
GAP $\alpha_4+\alpha_{12}$	-3.33E-2[b]	6.28E-3
LOAN $\alpha_5+\alpha_{13}$	6.19E-2[b]	1.06E-2
RISK $\alpha_6+\alpha_{14}$	5.02E-2	4.29E-2
LEAD $\alpha_7+\alpha_{15}$	1.17E-4	1.08E-4

[a] Variable definitions are detailed in Table 3-1.

[b] Significant at the 95% level for a one-tailed t-test using Newey-West standard errors.

TABLE 3-11

Economic Determinants of Third Party Guarantees

Sample of 38 small bank holding companies
(N=570)

$$RTPG = \alpha_{0i} + \alpha_1\ TA + \alpha_2\ LIQ + \alpha_3\ CAP + \alpha_4\ GAP + \alpha_5\ LOAN + \alpha_6\ RISK + \alpha_7\ LEAD + \alpha_8\ REG + \alpha_9\ TA{*}REG + \alpha_{10}\ LIQ{*}REG + \alpha_{11}\ CAP{*}REG + \alpha_{12}\ GAP{*}REG + \alpha_{13}\ LOAN{*}REG + \alpha_{14}\ RISK{*}REG + \alpha_{15}\ LEAD{*}REG + \mu_{6a}.$$

ADJ $R^2 = 0.259$

	Parameter Estimate	O.L.S. S.E.	White's S.E.	Newey-West S.E.
TA[a]	1.62E-9	8.76E-10	1.05E-9	1.64E-9
LIQ	-1.42E-3	5.70E-3	5.16E-3	6.36E-3
GAP	3.36E-3	3.53E-3	4.02E-3	5.23E-3
GAP	1.71E-3	2.93E-3	4.66E-3	4.68E-3
LOAN	3.10E-2[b]	6.66E-3	7.08E-3	9.53E-3
RISK	0.267[b]	4.87E-2	5.48E-2	7.57E-2
LEAD	-2.65E-4	7.50E-5	9.61E-5	2.34E-4
REG	-0.028	2.15E-2	2.12E-2	3.58E-2
TA*REG	-3.85E-10	5.06E-10	6.16E-10	8.95E-10
LIQ*REG	-1.52E-2[b]	5.70E-3	5.54E-3	7.46E-3
CAP*REG	-1.42E-3	3.77E-3	4.66E-3	5.81E-3
GAP*REG	1.65E-4	3.55E-3	3.67E-3	4.64E-3
LOAN*REG	5.34E-3	6.52E-3	6.10E-3	7.64E-3
RISK*REG	-0.227[b]	6.79E-2	7.79E-2	9.43E-2
LEAD*REG	2.19E-4	1.47E-4	1.44E-4	2.53E-4

[a] Variable definitions are detailed in Table 3-1.

[b] Significant at the 95% level for a one-tailed t-test using Newey-West standard errors.

TABLE 3-12

THIRD PARTY GUARANTEES

Post Risk-Based Capital Period
Coefficient Estimates
Sample of 38 small bank holding companies
(N=570)

$$RTPG = \alpha_{0i} + \alpha_1 TA + \alpha_2 LIQ + \alpha_3 CAP + \alpha_4 GAP + \alpha_5 LOAN + \alpha_6 RISK + \alpha_7 LEAD + \alpha_8 REG + \alpha_9 TA{*}REG + \alpha_{10} LIQ{*}REG + \alpha_{11} CAP{*}REG + \alpha_{12} GAP{*}REG + \alpha_{13} LOAN{*}REG + \alpha_{14} RISK{*}REG + \alpha_{15} LEAD{*}REG + \mu_{6a}.$$

$$\alpha = (\alpha_m + \alpha_n)$$

$$var(\alpha_m + \alpha_n) = var(\alpha_m) + var(\alpha_n) + 2\ cov(\alpha_m, \alpha_n)$$

	Parameter Estimate	Newey-West S.E.
TA[a] $\alpha_1+\alpha_9$	1.23E-9[c]	8.91E-10
LIQ $\alpha_2+\alpha_{10}$	-1.66E-2[b]	5.83E-3
CAP $\alpha_3+\alpha_{11}$	-6.05E-4	1.76E-3
GAP $\alpha_4+\alpha_{12}$	1.87E-3	3.92E-3
LOAN $\alpha_5+\alpha_{13}$	3.64E-2[b]	7.16E-3
RISK $\alpha_6+\alpha_{14}$	3.99E-2	5.22E-2
LEAD $\alpha_7+\alpha_{15}$	-4.60E-5	6.09E-5

[a] Variable definitions are detailed in Table 3-1.

[b] Significant at the 95% level for a one-tailed t-test using Newey-West standard errors.

[c] Significant at the 90% level for a one-tailed t-test using Newey-West standard errors.

TABLE 3-13

Economic Determinants of Loan Commitment Activity

Sample of all 85 bank holding companies
(N=1275)

$$\begin{aligned} RLC = {} & \alpha_{0i} + \alpha_1\ TA + \alpha_2\ LIQ + \alpha_3\ CAP + \alpha_4\ GAP + \alpha_5\ LOAN + \alpha_6\ RISK \\ & + \alpha_7\ LEAD + \alpha_8\ REG + \alpha_9\ TA{*}REG + \alpha_{10}\ LIQ{*}REG \\ & + \alpha_{11}\ CAP{*}REG + \alpha_{12}\ GAP{*}REG + \alpha_{13}\ LOAN{*}REG \\ & + \alpha_{14}\ RISK{*}REG + \alpha_{15}\ LEAD{*}REG + \mu_{it}. \end{aligned}$$

ADJ R^2 = 0.119

	Parameter Estimate	O.L.S. S.E.	White's S.E.	Newey-West S.E.
TA[a]	-1.00E-9	3.55E-10	2.99E-10	4.96E-10
LIQ	-0.036	0.032	0.038	0.036
CAP	0.044	0.023	0.021	0.036
CAP	0.046	0.019	0.018	0.067
LOAN	0.184[b]	0.039	0.038	0.083
RISK	0.121	0.269	0.325	0.561
LEAD	-2.16E-4	4.60E-4	4.00E-4	0.733
REG	-0.355[b]	0.134	0.038	0.055
TA*REG	1.84E-10	1.11E-10	8.65E-11	1.45E-10
LIQ*REG	0.025	0.030	0.031	0.176
CAP*REG	-0.017	0.024	0.028	0.043
GAP*REG	-0.016	0.024	0.028	0.061
LOAN*REG	0.023	0.035	0.036	0.067
RISK*REG	-0.736[c]	0.315	0.371	0.566
LEAD*REG	2.62E-3	9.17E-4	9.11E-4	0.807

[a] Variable definitions are detailed in Table 3-1.

[b] Significant at the 95% level for a one-tailed t-test using Newey-West standard errors.

[c] Significant at the 90% level for a one-tailed t-test using Newey-West standard errors.

TABLE 3-14

LOAN COMMITMENTS

Post Risk-Based Capital Period
Coefficient Estimates
Sample of all 85 bank holding companies
(N=1275)

$$RLC = \alpha_{0i} + \alpha_1 TA + \alpha_2 LIQ + \alpha_3 CAP + \alpha_4 GAP + \alpha_5 LOAN + \alpha_6 RISK + \alpha_7 LEAD + \alpha_8 REG + \alpha_9 TA*REG + \alpha_{10} LIQ*REG + \alpha_{11} CAP*REG + \alpha_{12} GAP*REG + \alpha_{13} LOAN*REG + \alpha_{14} RISK*REG + \alpha_{15} LEAD*REG + \mu_{6b}.$$

$$\alpha = (\alpha_m + \alpha_n)$$

$$var(\alpha_m + \alpha_n) = var(\alpha_m) + var(\alpha_n) + 2 cov(\alpha_m, \alpha_n)$$

	Parameter Estimate	Newey-West S.E.
TA[a] $\alpha_1+\alpha_9$	-8.18E-10[b]	4.39E-10
LIQ $\alpha_2+\alpha_{10}$	-1.17E-2	0.113
CAP $\alpha_3+\alpha_{11}$	2.73E-2[c]	1.85E-2
GAP $\alpha_4+\alpha_{12}$	3.02E-2	5.56E-2
LOAN $\alpha_5+\alpha_{13}$	0.207[b]	5.34E-2
RISK $\alpha_6+\alpha_{14}$	-0.615[b]	0.244
LEAD $\alpha_7+\alpha_{15}$	2.60E-3	0.318

[a] Variable definitions are detailed in Table 3-1.

[b] Significant at the 95% level for a one-tailed t-test using Newey-West standard errors.

[c] Significant at the 90% level for a one-tailed t-test using Newey-West standard errors.

TABLE 3-15

Economic Determinants of Loan Commitment Activity

Sample of 47 large bank holding companies
(N=705)

$$RLC = \alpha_{0i} + \alpha_1\ TA + \alpha_2\ LIQ + \alpha_3\ CAP + \alpha_4\ GAP + \alpha_5\ LOAN + \alpha_6\ RISK + \alpha_7\ LEAD + \alpha_8\ REG + \alpha_9\ TA{*}REG + \alpha_{10}\ LIQ{*}REG + \alpha_{11}\ CAP{*}REG + \alpha_{12}\ GAP{*}REG + \alpha_{13}\ LOAN{*}REG + \alpha_{14}\ RISK{*}REG + \alpha_{15}\ LEAD{*}REG + \mu_{6b}.$$

ADJ R^2 = 0.114

	Parameter Estimate	O.L.S. S.E.	White's S.E.	Newey-West S.E.
TA[a]	-1.29E-9[b]	4.09E-10	3.37E-10	4.86E-10
LIQ	0.032	0.049	0.060	0.043
CAP	-0.051	0.042	0.037	0.059
CAP	0.116[b]	0.032	0.029	0.043
LOAN	0.270[b]	0.057	0.067	0.057
RISK	0.743	0.388	0.473	0.802
LEAD	-4.33E-4	7.23E-4	6.45E-4	1.53E-3
REG	-0.422[b]	0.197	0.199	0.256
TA*REG	2.65E-10[b]	1.32E-10	9.29E-11	1.36E-10
LIQ*REG	-0.053	0.043	0.040	0.057
CAP*REG	0.116[b]	0.041	0.199	0.059
GAP*REG	-0.172[b]	0.041	0.040	0.047
LOAN*REG	-0.077	0.048	0.044	0.066
RISK*REG	-1.190[c]	0.434	0.503	0.779
LEAD*REG	3.52E-3[b]	1.36E-3	1.41E-3	1.86E-3

[a] Variable definitions are detailed in Table 3-1.

[b] Significant at the 95% level for a one-tailed t-test using Newey-West standard errors.

[c] Significant at the 90% level for a one-tailed t-test using Newey-West standard errors.

TABLE 3-16

LOAN COMMITMENTS

Post Risk-Based Capital Period
Coefficient Estimates
Sample of 47 large bank holding companies
(N=705)

$$RLC = \alpha_{0i} + \alpha_1\ TA + \alpha_2\ LIQ + \alpha_3\ CAP + \alpha_4\ GAP + \alpha_5\ LOAN + \alpha_6\ RISK + \alpha_7\ LEAD + \alpha_8\ REG + \alpha_9\ TA{*}REG + \alpha_{10}\ LIQ{*}REG + \alpha_{11}\ CAP{*}REG + \alpha_{12}\ GAP{*}REG + \alpha_{13}\ LOAN{*}REG + \alpha_{14}\ RISK{*}REG + \alpha_{15}\ LEAD{*}REG + \mu_{6b}.$$

$$\alpha = (\alpha_m + \alpha_n)$$

$$var(\alpha_m + \alpha_n) = var(\alpha_m) + var(\alpha_n) + 2\ cov(\alpha_m, \alpha_n)$$

	Parameter Estimate	Newey-West S.E.
TA[a] $\alpha_1+\alpha_9$	-1.03E-9[b]	4.43E-10
LIQ $\alpha_2+\alpha_{10}$	-2.14E-2	5.60E-2
CAP $\alpha_3+\alpha_{11}$	6.19E-2[b]	2.38E-2
GAP $\alpha_4+\alpha_{12}$	-3.17E-2	3.71E-2
LOAN $\alpha_5+\alpha_{13}$	0.193[b]	6.93E-2
RISK $\alpha_6+\alpha_{14}$	-0.448[b]	0.242
LEAD $\alpha_7+\alpha_{15}$	3.09E-3[b]	8.69E-4

[a] Variable definitions are detailed in Table 3-1.

[b] Significant at the 95% level for a one-tailed t-test using Newey-West standard errors.

TABLE 3-17

Economic Determinants of Loan Commitment Activity

Sample of 38 small bank holding companies
(N=570)

$$RLC = \alpha_{0i} + \alpha_1 TA + \alpha_2 LIQ + \alpha_3 CAP + \alpha_4 GAP + \alpha_5 LOAN + \alpha_6 RISK + \alpha_7 LEAD + \alpha_8 REG + \alpha_9 TA{*}REG + \alpha_{10} LIQ{*}REG + \alpha_{11} CAP{*}REG + \alpha_{12} GAP{*}REG + \alpha_{13} LOAN{*}REG + \alpha_{14} RISK{*}REG + \alpha_{15} LEAD{*}REG + \mu_{it}.$$

ADJ $R^2 = 0.289$

	Parameter Estimate	O.L.S. S.E.	White's S.E.	Newey-West S.E.
TA[a]	-1.66E-8[c]	6.57E-9	7.28E-9	8.84E-9
LIQ	-0.059[c]	0.041	0.036	0.348
GAP	0.072[b]	0.028	0.029	0.032
GAP	-0.012	0.022	0.019	0.025
LOAN	0.034	0.050	0.019	0.056
RISK	-1.120[b]	0.365	0.366	0.348
LEAD	1.06-3	5.62E-4	5.21E-4	1.21E-3
REG	-0.240	0.161	0.150	0.187
TA*REG	1.56E-8[b]	3.79E-9	4.43E-9	4.66E-9
LIQ*REG	0.202[b]	0.043	0.019	0.050
CAP*REG	-0.079[c]	0.028	0.041	0.042
GAP*REG	0.074[b]	0.027	0.026	0.026
LOAN*REG	0.209[b]	0.049	0.049	0.054
RISK*REG	-0.822[c]	0.509	0.636	0.546
LEAD*REG	7.26E-4	1.10E-3	9.29E-4	1.30E-3

[a] Variable definitions are detailed in Table 3-1.

[b] Significant at the 95% level for a one-tailed t-test using Newey-West standard errors.

[c] Significant at the 90% level for a one-tailed t-test using Newey-West standard errors.

TABLE 3-18

LOAN COMMITMENTS

Post Risk-Based Capital Period
Coefficient Estimates
Sample of 38 small bank holding companies
(N=570)

$$RLC = \alpha_{0i} + \alpha_1\ TA + \alpha_2\ LIQ + \alpha_3\ CAP + \alpha_4\ GAP + \alpha_5\ LOAN + \alpha_6\ RISK + \alpha_7\ LEAD + \alpha_8\ REG + \alpha_9\ TA{*}REG + \alpha_{10}\ LIQ{*}REG + \alpha_{11}\ CAP{*}REG + \alpha_{12}\ GAP{*}REG + \alpha_{13}\ LOAN{*}REG + \alpha_{14}\ RISK{*}REG + \alpha_{15}\ LEAD{*}REG + \mu_{6b}.$$

$$\alpha = (\alpha_m + \alpha_n)$$

$$var(\alpha_m + \alpha_n) = var(\alpha_m) + var(\alpha_n) + 2\ cov(\alpha_m, \alpha_n)$$

	Parameter Estimate	Newey-West S.E.
TA[a] $\alpha_1+\alpha_9$	-9.96E-10	6.34E-9
LIQ $\alpha_2+\alpha_{10}$	0.143[b]	3.54E-2
CAP $\alpha_3+\alpha_{11}$	-7.16E-3	1.81E-2
GAP $\alpha_4+\alpha_{12}$	6.16E-2[b]	2.16E-2
LOAN $\alpha_5+\alpha_{13}$	0.243[b]	5.37E-2
RISK $\alpha_6+\alpha_{14}$	-1.942[b]	0.338
LEAD $\alpha_7+\alpha_{15}$	1.78E-3[b]	5.33E-4

[a] Variable definitions are detailed in Table 3-1.

[b] Significant at the 95% level for a one-tailed t-test using Newey-West standard errors.

CHAPTER 4
THE IMPACT OF CONTINGENT COMMITMENT DISCLOSURES ON BANK VALUATION

Introduction

Although a large volume of research has been published on linking accounting disclosures and market values, financial innovations as well as the very nature of off-balance sheet financing continue to lead markets away from book values. This study investigates the extent to which disclosures of contingent commitments contribute in explaining the difference between book and market values of bank equity holdings. Nominal disclosures of off-balance sheet activities should provide value-relevant information if financial accounting is to play a role in pricing by financial markets.

Typically, accounting disclosures of contingent commitments consist of reporting the nominal amounts of financial guarantees issued to potential borrowers. Two types of contingent commitments are examined in this study: third party guarantees (TPGs) and loan commitments (LCs). Although these contingent commitments increase banks' exposure to interest rate risk, liquidity risk, capital adequacy risk, and credit risk, no liability is shown on or off the balance sheet. In fact, the only balance sheet evidence of these transactions is derived from the fee revenues earned.

This study uses quarterly Federal Reserve Y-9 data for 85 bank holding companies between 1986 and 1991, and finds that the nominal disclosures explain part of the difference between banks' market and book values in the form of a negative correlation between the commitment activity and market values of equity. This negative association is stronger for TPGs than for LCs.

Contingent commitments have qualities of both assets and liabilities, which makes valuation difficult. For irrevocable commitments, the fee revenues underwrite the risk of costly funding when commitments are exercised. For other types of commitments value is generated only when commitments are exercised. The cost of funding exercised commitments (funding risk) should depend on the bank's liquidity and capital levels.

Prior to the adoption of risk-based capital requirements it was widely believed that banks participated in these activities to circumvent regulatory capital and reserve requirements that arise when transactions are formally booked in the traditional financial statements. However, when risk-based capital (RBC) became effective in 1989, banks shifted away from the more heavily weighted third party guarantees to loan commitments (see chapter 3). Prior to RBC, banks were not required to hold capital against off-balance sheet commitments. After RBC, banks were required to hold capital that could amount to as much as 7.5% of face value for the riskiest types of third party guarantees. Given the small fee income generated by TPGs, risk-based capital requirements reduced the profitability of this activity for capital constrained banks. Consistent with this I find that risk-based capital requirements reduced the value of third party guarantees for large banks, which were most affected by the change in capital regulation.

Risk-based capital did not impose such rigid capital requirements on LCs. They are positively related to the market value of banks and are more valued by large banks in the post-RBC period. The positive value of LCs is consistent with their potential to become revenue-generating loans both directly and from the goodwill that a bank/customer relationship of this type generates. The increased value of LCs post-RBC suggests that the increase in loan commitment activity may have been a compensation for the decline in the more costly TPGs. This finding requires more evidence because the regulatory shift coincided with a favorable change in macroeconomic conditions, suggesting that the observed increase in value may be the result of an increase in expected future loans.

This chapter is organized as follows. The following section provides a discussion of contingent commitment valuation. Next, the empirical implications and detail on the data used in the study are presented. The next section provides a discussion of the results of the empirical tests. The chapter ends with a summary of the findings.

Valuation Implications of Loan Commitment Activity

The relevance of off-balance sheet information in valuation has been examined in several different contexts. Some earlier research (Barth 1991, Landsman 1986) show that off-balance sheet disclosures of unfunded vested pension benefits is significant in explaining the market value of equity. Ronen and Sondhi (1990) show that firms are able to create finance subsidiaries that increase leverage without reflecting the effect in the parent company's books. These are accompanied by implicit guarantees by the parent company, which increases both risk and return to stockholders. These studies provide evidence that market valuations recognize off-balance sheet activities. Contingent commitments differ from other off-balance sheet disclosures that have been studied like unfunded pensions because the values of the former are tied to other firm specific attributes.

Valuation of Off-Balance Sheet Guarantees

The bank, as a financial intermediary, borrows funds from depositors and lends to customers. The spread between rates paid to depositors and received from borrowers creates profits for the bank. Off-balance sheet guarantees are commitments by banks that utilize their reputational capital to generate income. If customers exercise their options to acquire financial resources, assets are created in the form of loans. These loans must be funded either by deposits or by more costly sources. While contingent commitments generate fee revenues and interest on loans that eventually arise from some of these guarantees, there is an associated potential obligation to fund these loans. Therefore, the benefit of the commitment to the bank is dependent on the fees charged, the takedown rate, and the cost of funding commitments that are exercised.[1] The conditions under which commitments are taken down differs by type of commitment and has important implications to the bank regarding pricing and value.

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[1] Part of the value of contingent commitments comes from their fee structure and contribution to the diversification of risk. The multiple fee structure of contingent commitments differentiates them from spot loans. In addition to interest rates that are charged on the portion of the commitment taken down, banks may charge a fee based on the total commitment, or on the unused portion of the commitment. Thakor and Udell (1987) show that this type of fee structure results in optimal risk sharing when banks do not know the takedown probabilities of borrowers. In their model borrowers separate themselves out through their contract choice. Thus contingent commitments allow banks to diversify some of the risk inherent in the spot loan market.

Third party guarantees (TPGs) are more risky for the bank than loan commitments because they more closely resemble insurance policies. Unexercised TPGs are contingent commitments that can be costly to the bank only if they are exercised. This implies that off-balance sheet disclosures of outstanding TPGs report the maximum potential liability of the bank under these guarantees. Loan commitments represent potential loans that would generate profits for the bank if they are taken down.

In contrast with TPGs, unexercised LCs represent positive expected net present value projects to the bank since they generate value for the bank only when taken down. In fact, when opportunity costs are considered, unexercised loan commitments may end up to be costly to the bank. Off-balance sheet disclosures of LCs are measuring these unexercised commitments. Once LCs are taken down they become value enhancing to the bank and at the same time are moved to the balance sheet.

Contingent commitments are essentially put options held by the purchaser of the commitment and written by the bank. The borrower pays a fee in exchange for the option to exercise the put for the amount of the commitment. The borrower exercises the option when the rate at which it can borrow in the spot market (r_s) exceeds the rate of the commitment. Most commitments are for floating rate loans allowing the borrower to borrow at the prime rate (r_p) (or a money-market rate such as the London InterBank Offer Rate) plus a fixed risk premium (k). Thus, the borrower exercises the option when the cost of a loan if they borrowed elsewhere, would be greater than r_p+k.

When a bank initially issues a commitment it incurs substantial costs to audit the borrower, to evaluate the assets usable for collateral, and related legal expenses. In addition to these start-up costs, there continues to be monitoring costs.However, if banks have a comparative advantage as delegated monitors, an ongoing bank-customer relationship is valuable to both parties (James 1981, 1987). These costs are recoverable from borrowers in the rates charged on loans taken down, and for TPGs in the form of charged fee rates. Since these costs are spread over a greater volume of transactions, the cost of a loan under commitment is almost always lower than the cost of a spot loan. The other important feature of commitments is that once the contract is established, borrowers have an immediate source of funds, while, in contrast, the time lag involved in securing funds under a spot loan transaction can involve substantial costs to the borrower. Therefore, the cost of a loan made under a loan commitment can be substantially lower than the cost under a spot loan when transactions costs are factored in. The two types of contingent commitments examined in this study have different valuation implications due to the conditions under which they would be exercised.

Third party guarantees

Third party guarantees are primarily used to guarantee commercial paper, municipal borrowings, and construction loans. There are two basic types of standby letters of credit (SLCs). The first type provides third parties insurance against credit risk, and the second type provides the borrower with a liquidity guarantee. Contracting with a bank for the first type of SLC allows the borrower to reduce its cost of capital in financial markets.[2] The bank accepts a fee upfront in return for the promise to pay the third party in the event of default by the borrower. These SLCs are activated by the borrower's default and are directly analogous to insurance. The bank's guarantee is exercised when the borrower defaults on an obligation to a third party, which increases the possibility of the bank losing money. Since the early 1980's the volume of SLCs issued have dramatically increased. Direct financing of firms by issuing commercial paper has increased substantially, which means that increasingly riskier firms are contracting for financial guarantees. Also, being subjected to losses from individual defaults are not the only risk that must be priced when issuing these commitments. Unlike traditional insurance contracts, SLC takedowns are not independent events that occur by accident or nature. Declining economic conditions increases the probability that a large number of guarantees will have to be honored simultaneously in the system. Accordingly, systemic risk would be higher for this type than for other types of contingent claims.

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[2] Studies have also argued that the demand for these SLCs is related to signalling whereby good quality borrowers use SLCs to convey their type to investors (Kanatas 1987).

The second type of SLC is called an irrevocable revolving credit (IRC). This type acts as insurance against liquidity risk for borrowers since the bank promises to lend money to fund their commitments. Irrevocable revolving credit agreements are often exercised by borrowers in cases when they are trying to rollover their commercial paper in a tight credit market. In these situations, borrowers exercise their SLCs and use bank funds to hold them over until they are able to issue their commercial paper. These SLCs are also used to ensure liquidity for putable municipal bonds.

The possibility of system-wide risk also exists for these types of SLCs. Increases in interest rates may result in a large number of investors exercising options on municipal bonds that have the put feature, causing a high demand for liquidity.

An historical example of the systemic risk associated with IRC commitments occurred in 1970 when Penn Central went bankrupt. When they defaulted on their \$82 million in outstanding commercial paper the commercial paper market temporarily dried-up and caused a liquidity crisis. Borrowers unrelated to Penn Central could not place their commercial paper and outstanding nonbank commercial paper dropped by \$3 billion. A major liquidity crisis was averted when the Federal Reserve, as lender of last resort, provided loans to banks of a size triple the level that prevailed prior to Penn Central's failure.[3]

In summary, standby letters of credit are riskier than loan commitments because they are irrevocable by the bank and are exercised when the borrower is facing adverse financial conditions.

Valuation of third party guarantees

The value of TPGs is illustrated in the following two-date model. Assume that TPGs are issued and the borrower pays a fee to the bank at time $t = 0$. At $t = 1$, the loan matures and the borrower either pays interest and principal or defaults. If default occurs the commitment is exercised and the bank steps in as guarantor.

The net present value of TPGs at t=0 can be written as

NPV_0^{TPG} = fee revenues - E(losses from borrower default)

- regulatory costs

---

[3] See Calomiris (1989) for a detailed discussion of the Penn Central failure.

$$= r_{fTPG} \cdot TPG_0 + E\left\{x \cdot TPG_0 \cdot \left[\frac{(1 + r_p + k*)}{(1 + r_p + k_b)^2} - \frac{(1 + r_n(d))}{1 + r_c}\right]\right\}$$

$$- E\,(L_D) - C_R.$$

$$= r_{fTPG} \cdot TPG_0 + E\left[\frac{x \cdot TPG_0 \cdot (1 + r_p + k*)}{(1 + r_p + k_b)^2}\right] - E\left[\frac{x \cdot TPG_0 \cdot (1 + r_n(d))}{1 + r_c}\right.$$

$$- E\,(L_D) - C_R. \qquad (4.1)$$

where

r_{fTPG} = fee rate charged on TPGs;
x = expected takedown rate on TPGs;
r_p = prime rate;
k^* = firm specific add-on factor;
$r_n(d)$ = cost of funding TPGs taken down;
k_b = discount factor based on borrower risk;
r_c = bank's cost of capital;
L_D = losses on borrower default; and
C_R = regulatory costs.

If TPGs are priced to be actuarially fair, then the following must hold:

$$r_{fTPG} \cdot TPG_0 = E\left[\frac{x \cdot TPG_0 \cdot (1 + r_p + k*)}{(1 + r_p + k_b)^2}\right] - E\left[\frac{x \cdot TPG_0 \cdot (1 + r_n(d))}{1 + r_c}\right] - E(L_D) - C_R. \tag{4.2}$$

Since fees charged on TPGs are nontrivial, the expected costs associated with issuing guarantees exceeds the expected revenues from resulting loans. The impact of this transaction on the balance sheet is shown in the next section.

Loan commitments

Loan commitments are agreements whereby the bank commits to lending up to a certain amount of money and borrowers must pay a fee on the unused portion of the commitment. Loan commitments that are taken down become loans that must pay interest equal to the prime rate plus a risk premium ($r_p + k_i$).[4] The add-on factor is not renegotiated at the time of takedown, and firms will only choose to use the commitment if it is deemed less costly than a spot loan.

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[4] Loan commitments incorporate a "material adverse change" clause that allows the bank to not honor the commitment when there has been a substantial decline in the potential borrower's credit risk, however significant changes in the credit risk of the borrower are allowed before this clause takes effect.

Loan commitments are taken down under less adverse conditions than TPGs, and are also revocable when there are substantial changes in the credit risk of the borrower; hence, they are relatively less risky to banks. Loan commitments are used by borrowers to reduce uncertainty and to enhance availability of credit. The fee rates charged on these types of commitments are nominal (and might be zero for some banks) and are often insufficient to cover the initial contracting costs.[5] Unlike TPGs, fees are not used to underwrite the costs associated with these commitments. The value of a loan commitment to the bank can be examined using a discounted future cash flows model. In this framework the value of a loan commitment can be expressed as the present value of interest expected to be earned on loans issued when commitments are exercised, less the expected funding costs. The value of loan commitments can be illustrated in the same basic two-date model used for TPGs. The net present value of a loan commitment to the bank can be expressed as

$$
\begin{aligned}
NPV_0^{LC} &= \text{fee revenues} \\
&\quad + E(\text{net revenues from loans taken down})
\end{aligned}
$$

---

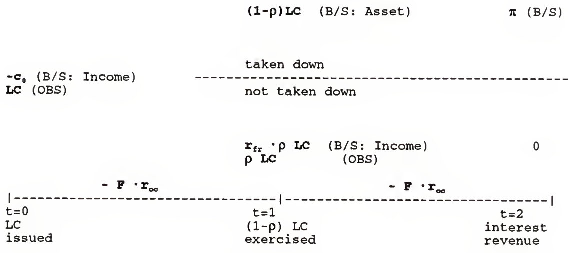
[5] An industry source indicated that market competition has driven the fee rate to zero on small loan commitments, however a rate of 25 basis points is charged on loan commitments between $10-$20 million.

$$= r_{flc} \cdot LC_0 + \left[(1-\rho) \cdot LC_0 \cdot \frac{(1 + r_p + k_i)}{(1 + r_p + k_{LC})^2} \right] - \left[(1-\rho) \cdot LC_0 \cdot \frac{(1 + r_n(d))}{1 + r_c} \right] \tag{4.3}$$

where 1-ρ is the expected takedown rate on LCs. Unlike TPGs, the first term (fee revenues) for LCs is not significant relative to the profits generated from loans taken down. Therefore,

$$\frac{(1 + r_p + k_i)}{(1 + r_p + k_{LC})^2} \geq \frac{(1 + r_n(d))}{1 + r_c}$$

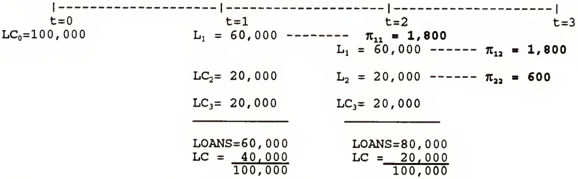
Loan commitment disclosures impact value differently from TPGs due to the fact that these types of commitments generate value once they are taken down and, because of the existence of a material adverse change clause, the expected bankruptcy losses are not significant. In addition, the regulatory cost is not significant on these types of off-balance sheet activities under risk-based capital guidelines. Unexercised commitments represent positive net present value projects that have not yet been undertaken. A simplified three-date model illustrates the way in which LCs are related to balance sheet (B/S) and off-balance sheet (OBS) disclosures:



At t = 1 a percentage $(1-\rho)$ of the LCs are exercised, and the loans issued are booked as assets for the bank. These loans are expected to generate profits through interest payments, which also cover the costs $(-c_0)$ incurred at t = 1. The LCs not exercised represent positive net present value projects to the bank that have not yet been taken down, and earn only a nominal amount equal to $(r_{fLC} \cdot \rho \text{ LC})$. Since banks must fund LCs that are taken down, they must have available funds equal to $F = f((1-\rho), \text{LC})$, where $f_{(1-\rho)} > 0$ and $f_{LC} > 0$. The opportunity cost for holding each dollar of F is equal to r_{oc}.

The following numerical example illustrates the dynamics of how loan commitments create value for a bank and where they are disclosed in the financial statements at the various stages. Assume a bank issues a $100,000 loan commitment (LC). The borrower can exercise any portion of the LC and get a loan at t = 1 and t = 2. The fee rate is zero. At t = 1, $60,000 is borrowed from the LC (i.e. a $60,000 loan goes on the balance sheet), leaving $40,000 in unexercised LCs. Interest is earned on the loan (L_1) at a rate equal to 7% a year, which is set so that the bank recovers initial contracting costs and ongoing monitoring costs. The cost of funds is 4% and assume the discount factor is 1. At t = 2 the customer borrows an additional $20,000, thus loans outstanding total $80,000 and unused LC equals $20,000.

This is depicted in the following diagram:[6]



The loans and outstanding LCs are valued at t = 1 assuming perfect foresight.

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[6] The profits earned by loan i in period j (π_{ij}) is:

π_{11} = (0.07 x $60,000) - (0.04 x $60,000) = $1,800
π_{12} = (0.07 x $60,000) - (0.04 x $60,000) = $1,800
π_{22} = (0.07 x $20,000) - (0.04 x $20,000) = $600

Case A: No Opportunity Cost

In this case, I assume that there are no costs associated with having outstanding loan commitments. For example, the bank does not need to set aside earning assets to fund loans taken down. Implicitly I am assuming a zero discount rate by taking the t = 1 net present value of the exercised commitments (NPV_{Ex}) to be $\pi_{11} + \pi_{12}$.

LCs Exercised: $NPV_{Ex} = \pi_{11} + \pi_{12}$

$= 3{,}600.$

LCs Unexercised: $NPV_{Unex} = \pi_{22}$

$= 600.$

In this case, the net present value of the off-balance sheet LC is \$600, which arises from expected future loans.

Since LCs can be taken down at any point in time banks must manage the interest rate risk, liquidity risk, and capital adequacy risk that is created by these outstanding contingencies. Outstanding LCs do not represent contingent liabilities as is the case for TPGs. Loan commitment disclosures represent the potential positive NPV projects that may be issued in the future and also reflect the opportunity cost of having available funds for outstanding commitments. Consider the following case which incorporates opportunity costs:[7]

Case B: Opportunity cost of unexercised commitments = 1.5%
Under this scenario I assume that the bank must maintain liquid assets to fund loan commitments that are expected to be exercised. The foregone profits from maintaining this liquidity is assumed to be 1.5% of the face value of the outstanding commitment.

|--------------------|--------------------|--------------------|
$t=0$ $\qquad$ $t=1$ $\qquad$ $t=2$ $\qquad$ $t=3$

$LC_0 = 100{,}000$

$L_1 = 60{,}000$ -------- $\pi_{11} = 1{,}800$
$L_1 = 60{,}000$ ------ $\pi_{12} = 1{,}800$

$LC_2 = 20{,}000$ ------- $oc_{11} = -300$
$L_2 = 20{,}000$ ------ $\pi_{22} = 600$

$LC_3 = 20{,}000$ ------- $oc_{21} = -300$
$LC_3 = 20{,}000$ ------ $oc_{22} = -300$

	$t=1$	$t=2$
LOANS	60,000	80,000
LC	40,000	20,000
	100,000	100,000

LCs Exercised: $\quad NPV_{Ex} = \pi_{11} + \pi_{12} = 3{,}600.$

LCs Unexercised: $\quad NPV_{Unex} = \pi_{22} - oc_{11} - oc_{21} - oc_{22}$

$$= 600 - 3(300)$$

$$= -300.$$

When opportunity costs are factored in, the off-balance sheet LC is worth -$300 at t=1. Note that each loan that is issued has a positive net present value; Loan 1 has a net present value of \$3,600; Loan 2 has a net present value of \$300. Because of the opportunity costs, the net present value of the unexercised loan commitment (LC_3) is -\$600. This example shows that when LCs are exercised they become positive net present value projects to the bank, which coincides with the point at which they are booked on the balance sheet. Unexercised commitments are costly to the bank due to funding considerations. Depending on the ability of a bank to manage this funding risk, off-balance sheet disclosures of unexercised LCs may be positively or negatively associated with equity value.

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[7] The opportunity cost of providing for outstanding LC i in period j (oc_{ij}) is $oc_{11} = oc_{21} = oc_{22} = -\$20{,}000 \times 0.015 = -300$.

The costs associated with unexercised loan commitments arise from two sources (1) the inability to recover initial transactions costs associated with issuing an LC, and (2) the opportunity cost of maintaining liquidity to fund LCs that are taken down. The longer loan commitments remain outstanding, the higher the opportunity costs incurred by the bank; hence, the lower the value of the LC to the bank. Banks may have the ability to issue a higher volume of profit generating loans but may not have sufficient demand due to poor economic conditions in the bank's region. This excess capacity may be reflected in unexercised loan commitments. Therefore, volume of unexercised LCs may be proxying for macroeconomic conditions that influence the profitability of the bank. Such a proxy is disclosed to users of financial statements in the footnotes.

To summarize, LCs have the potential to generate net present value projects for the issuing bank through future loans that might be taken down. Unexercised commitments can be costly to the bank due to opportunity costs. Alternatively, their disclosure may also reflect excess loan capacity or slack. Another potential cost of issuing LCs is associated with adverse selection of loans that are exercised. This adverse selection problem contributes to the risk associated with loan commitments, although it is not believed to be the major factor influencing equity valuation. This is discussed further in Appendix A.

The following section illustrates the impact of these disclosures in a balance sheet-based model of valuation.

Market Valuation and Book Values

The market value of equity, MVE, can be expressed as

$$MVE = MVA + MVL + MVOBS, \tag{4.4}$$

where

MVA = market value of balance sheet assets
MVL = market value of balance sheet liabilities
MVOBS = market value of off-balance sheet items.

Since market values of assets and liabilities are unobservable and book values measure market values with error this can also be written as

$$MVE = \alpha_0 + \alpha_1 BVA + \alpha_2 BVL + \alpha_3 OBS + \varepsilon_5 \tag{4.5}$$

where

BVA = book value of assets,
BVL = book value of liabilities,

OBS = disclosures of off-balance sheet activities

$\varepsilon_5 = \mu_{BVA} + \mu_{BVL} + \mu_{OBS}$.

If we explicitly include the value of third party guarantees and loan commitments in this equation and assume that other off-balance sheet activities are uncorrelated with these commitments the relationship becomes[8]

$$MVE = \alpha_0 + \alpha_1\, BVA' + \alpha_2\, BVL + \alpha_1\, [r_{fs} \cdot TPG_0] + \alpha_1\, [r_{fr} \cdot LC_0] + \alpha_3\, \pi_{TPG} + \alpha_4\, \pi_{LC} + \varepsilon_6 \qquad (4.6)$$

where

$BVA' = BVA - r_{fs} \cdot TPG_0 - r_{fr} \cdot LC_0$;

$\varepsilon' = \varepsilon_{BVA'} + \varepsilon_{BVL} + \varepsilon_{TPG} + \varepsilon_{LC}$;

$r_{fs} \cdot TPG_0$ = fee income from TPGs;

$r_{fr} \cdot LC_0$ = fee income from LCs;

L_D = losses on borrower default;

C_R = regulatory costs;

$$\pi_{TPG} = x \cdot TPG_0 \cdot \left[\frac{(1 + r_p + k*)}{(1 + r_p + k_{TPG})^2} - \frac{(1 + r_n(d))}{1 + r_c} \right] - L_D - C_R \text{ ; and}$$

$$\pi_{LC} = (1-\rho) \cdot LC_0 \cdot \left[\frac{(1 + r_p + k_{LC})}{(1 + r_p + k_{LC})^2} - \frac{(1 + r_n(d))}{1 + r_c} \right] .$$

The term π_{TPG} represents the net present value of third party guarantees (net of fees). This amounts to the expected net revenues from guaranteeing a defaulted loan, less regulatory costs. Note that fee revenues are received at t = 0 and are included in net income and retained earnings for that period. Thus, the fee portion of the TPGs is impounded in booked assets. Similarly, π_{LC} represents the expected net present value of commitments to lend in the future. The relationship given in equation 4.6 implies that TPG disclosures measure the unrecorded liability (which is equal to the face value of the option) that is created when these types of guarantees are provided, assuming that expected losses due to borrower default are non-trivial. The terms in equation 4.6 are reflected in book value, with the exception of π_{TPG} and π_{LC} which are reported off-balance sheet.[9]

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[8] For simplicity the coefficients on BVA', $[r_{fs} \cdot TPG_0]$, and $[r_{fr} \cdot LC_0]$ are assumed to be the same. However, the coefficients do not necessarily have to be equal.

In general, the net present value of TPGs outstanding, net of fees (π_{TPG}), is expected to be negative. Loans taken down under LCs are expected to generate profits for the bank. However, unexercised LCs may be costly depending upon the bank's ability to manage funding risk.

Empirical Implications

The above analysis leads to three testable implications. The first addresses the impact of contingent commitment disclosures on valuation; the second identifies firm-specific attributes that influence the valuation of these commitment disclosures; and the third examines the effect of risk-based capital on these disclosures.

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[9] This is directly analogous to the case of insurance policies that are written. Insurance premia are booked as revenues while the policies represent contingent liabilities. When customers exercise their insurance option it is bad news for the insurer.

The first hypothesis examines the relevance of nominal commitment disclosures in explaining market values of bank equity. The above analysis illustrates that TPG disclosures in a balance-sheet based model of valuation measure the liability portion of these activities. When default costs are nontrivial, the level of nominal TPG disclosures is expected to be inversely related to the market value of bank equity. Loan commitments serve a different purpose than TPGs. Loan commitments generate profit-increasing loans that would imply a positive relationship between LC disclosures and bank value. However, in the presence of sufficiently high opportunity costs, the value of unexercised LCs may be negative.

The first two hypotheses tested are

H_1: Third party guarantee disclosures are negatively related to bank value, and

H_2: Third party guarantees (TPGs) have a higher liability value associated with them than loan commitments (LCs).

To test these hypotheses, the following regression model will be estimated:

$$MVE = \alpha_0 + \alpha_1 \, BVE + \alpha_2 \, TPG + \alpha_3 \, LC + \varepsilon_7 \qquad (4.7)$$

Hypothesis one predicts that α_2 is negative. Since TPGs have a higher liability associated with them than LCs, H_2 predicts that α_2 is more negative than α_3.

Contingent Commitment Valuation and Bank Size

As documented in chapter 3, large banks issue more loan commitments relative to asset size than smaller banks. This is consistent with the idea that contingent commitments issued by strong banks are more valuable to customers whether they are made by solvent small banks or banks that regulators believe are too-big-to-fail (TBTF). Further, scale economies associated with contingent commitments may give large banks a comparative advantage in issuing these financial instruments.[10] By issuing more commitments, large banks are better able to predict the probability of takedown and to diversify credit risk over a larger number of commitments. This implies that the distribution of takedown rates decreases as the volume of commitments increases. With a more accurate prediction of takedown rates, banks are able to reduce the opportunity cost of maintaining high levels of liquidity for unexercised commitments. These arguments suggest that the valuation relationship should differ between small and large banks.

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[10] In addition, large banks are better able to match large borrowers and lenders if the purposes of issuing SLCs is to create secured loans (Benveniste and Berger 1987, James 1988). This point is discussed further in chapter 5.

Risk-Based Capital

Risk-based capital requirements were adopted in August 1988 and took effect beginning in 1990. Under the new regulation, off-balance sheet activities are first converted to balance sheet equivalents. Third party guarantees are converted at either 100% or 50%, while LCs are converted at 50% or 20%. Risk weights of 20%, 50% or 100% are then applied based on estimated credit risk. This process of risk-weighting is applied to all balance sheet assets and off-balance sheet components. Tier 1 capital must exceed 3.625% of the total risk-weighted "assets" of a bank.

In general, RBC should reduce the value of all off-balance sheet commitments. However, RBC imposed a larger tax on TPGs; thus, these types of commitments should experience a larger decrease in value than LCs in the post-RBC period.

The RBC hypothesis is

H_3: Risk-based capital requirements make third party guarantees (TPGs) less profitable in the post-RBC period.

A modified version of regression (4.7) is used by adding a regulatory dummy variable (REG) that has interaction terms with the levels of TPG and LC. REG is equal to one in the post-RBC period (from March 31, 1990, to December 31, 1991) and zero for pre-RBC (from June 30, 1986, to June 30, 1988). The interim period between RBC adoption and institution is excluded from this part of the analysis because banks could be reorganizing their portfolios in response to the new tax. Since commitments tend to be relatively short in duration, the anticipated period for portfolio shifts is less than the transition period.

Funding Risk

As illustrated in equation 4.6, the value of contingent commitments depends on the expected cost of funding the commitments that are exercised. Banks may keep an inventory of liquid funds available for potential takedowns under commitments. Banks without a sufficient level of liquid funds face costly funding if actual takedown rates exceed projected rates.[11] There is also an opportunity cost associated with maintaining liquidity in excess of demand. Since takedown rates and future availability of low cost funds are unobservable, a measure of current liquidity is used as a proxy for funding risk.[12] The fourth hypothesis to be tested is

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[11] The Federal Reserve's discount window allows banks to borrow for short periods to cover liquidity needs, however excessive use of the discount window due to poor liquidity management may be costly in other ways. Calomiris (1989) alludes to these "non-pecuniary" costs of discount window abuse. In cases of system-wide liquidity demand the Federal Reserve is likely to be more tolerant as illustrated in the Penn Central case.

H_4: The extent to which contingent commitment disclosures are associated with decreases in bank equity value is dependent upon the bank's ability to fund exercised commitments. The lower the bank's funding risk the greater the net present value of commitments.

To examine the effect of funding risk on commitment valuation, the sample is partitioned into low and high funding risk groups. A dummy variable (DUM) for high and low funding risk is interacted with TPG and LC to determine whether funding risk affects the value of commitments. The following regression model is estimated:

$$\begin{aligned} MVE = \alpha_0 + \alpha_1\ BVE + \alpha_2\ TPG + \alpha_3\ LC \\ + \alpha_4\ DUM{*}LC + \varepsilon_8 \end{aligned} \qquad (4.8)$$

Two alternative measures of funding risk are used. The first proxy is liquidity to total contingent commitments (LIQTCC). Liquidity is defined by the IDC Financial Publishing Inc. liquidity formula to consist of

> marketable securities maturing within 5 years, all floating rate securities, Federal Funds sold, securities purchased under agreements to resell, and interest-bearing balances due from depository institutions less all uninsured deposits and interest-bearing deposits in foreign offices, Edge and Agreement subsidiaries, and in IBFs as well as Federal Funds

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[12] The assumption that banks have an infinitely elastic demand for low cost deposit funds implies that other sources of funding are strictly more costly than available funds. The extent to which Fed Funds are available to the bank is another low cost funding source that is not included in the liquidity measure. The ability for a firm to use this as a normal source of funding is restricted since the Federal Reserve's intent to be a "lender of last resort" discourages abuse of discount window privileges.

> purchased, securities sold under agreement to repurchase and other borrowed money (1988, p 1).

The predicted sign of the slope shifts in equation 4.8 (α_4) is positive. That is, the higher the liquidity, the lower the funding risk and the higher the value of loan commitments outstanding.

The second proxy for funding risk uses the maturity composition of banks' assets and liabilities. The higher the net assets maturing or repricing within one year relative to total assets, the lower is the expected funding risk. This variable (GAPTA) is used to partition banks into high (GDUM = 1) and low (GDUM = 0) firms, and GDUM is interacted with TPG and LC. The model in equation 4.8 is estimated with GDUM*LC. The predicted signs of the slope shifts (α_4) is positive.

Size Differences and Funding Risk

Two reasons exist for funding risk to vary with bank size. In general, large firms have easier access to capital markets than small firms. This may also be true of banks and their ability to acquire liquidity on short notice. If large banks have an advantage over small banks at the Federal Reserve's discount window, there is little reason for these banks to maintain liquidity of a magnitude sufficient to fund potential commitments taken down. The too-big-to-fail argument may also influence funds availability. In terms of equation 4.6, this implies that large banks have a funds availability profile ($r_n(d)$) that reflects a higher volume of low cost sources of funding available to them, hence a lower opportunity cost of maintaining liquid funds for outstanding commitments. This implies that contingent commitments are more valuable for these banks.

The second reason for funding risk depending on bank size is that the method of funding may differ across size groups. Deshmukh, Greenbaum, and Kanatas (1983) present two models of bank behavior. Banks that maintain an inventory of funds by borrowing in advance of its needs to accommodate future contingencies are referred to as "asset transformers." "Brokers," on the other hand, maintain a more closely matched portfolios and face a higher degree of funding risk when funds are needed. If the model choice of funding is size specific, size may also present differences in the degree to which funding risk affects bank equity value.

Capital

The value of commitments depends on the bank's capital position due to the existence of a fixed rate deposit insurance. In the absence of risk-based capital regulation, the insurance put option creates the incentive for banks to increase risk by issuing third party guarantees.[13] Third party guarantees transfer wealth from the FDIC to equity holders. The FDIC insurance put option hypothesis predicts that risky activities are more valuable as capital levels decrease. If the bank is well capitalized, the value of FDIC insurance would not be dramatically affected by increases in risk (the implicit put option is well out of the money). On the other hand, when the firm is not well capitalized and the option is closer to being in the money, the value of the option will increase with risk. The insurance option hypothesis predicts that low capital firms that issue TPGs increase bank value by increasing the value of the deposit insurance option. This hypothesis is stated as follows:

H_5: Increases in TPGs outstanding are positively associated with increased value when capital level is low. When capital level is high increases in TPG activity levels are associated with decreased value.

In the post-RBC period, increases in off-balance sheet activities impose additional capital requirements on banks, which reduced banks' ability to increase the value of the insurance option by issuing TPGs. For poorly capitalized banks, it is expected that TPGs would be less valuable post-RBC. Loan commitments are less risky than TPGs, which means that they would be less likely to cause a transfer of wealth from the FDIC.

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[13] Consistent with James (1988), standby letters of credit are assumed to be strictly risk increasing.

To test this hypothesis, banks are classified into high-and-low capital banks based upon the extent to which capital requirements are binding constraints. Actual capital is the ratio of core capital to total assets. The capital constraint variable (CAP) used in the analysis is defined as the difference between actual and required capital divided by actual capital. In the pre-RBC regime required capital is calculated as five-and-a-half percent of total assets. In the post-RBC regime balance sheet and off-balance sheet activities are given risk weights to determine required capital.

The risk weighted capital required of each bank is not publicly disclosed, however the actual amount of capital held by banks is available for the period March 31, 1990, to September 30, 1991. The required risk-based capital from the fourth quarter of 1991 was used to estimate the weights given to the on- and off-balance sheet components. Estimates of required risk-based capital were calculated for the preceding six quarters. This estimation is described in further detail in chapter 3.

Regression analysis is done using a dummy variable as a slope shift for TPG, where CDUM=1 for when capital constraints are binding (CDUM=0 for nonbinding capital constraint). CDUM is multiplied by TPG to test for the effect of these commitments on equity value conditional on the level of capital. The estimated regression model is:

$$\begin{aligned} MVE = {} & \alpha_0 + \alpha_1 \text{ BVE} + \alpha_2 \text{ TPG} + \alpha_3 \text{ LC} \\ & + \alpha_4 \text{ CDUM*TPG} + \varepsilon_9. \end{aligned} \tag{4.9}$$

If α_4 is negative (positive) then TPGs are more valuable for high capital banks, consistent with the insurance option hypothesis. When capital regulation incorporates off-balance sheet activities into required capital, third party guarantees become more costly. It is predicted that after risk-based capital requirements are adopted, the value of TPGs is lower for poorly capitalized banks than for well capitalized banks.

Control Variables

Three control variables (repricing profile multiplied by interest rate change, liquidity relative to total assets, and capital constraint) are included in the basic regression model. These variables are expected to convey information about the market value of banks that is not reflected in book values. They also potentially affect the valuation implications of commitment disclosures since off-balance sheet financing strategy may depend on these factors.

The book values of assets and liabilities accurately reflect market values when they are booked. However, subsequent changes in interest rates affect the market values of both assets and liabilities. Thus, the maturity profile or GAP multiplied by changes in interest rates is included as a control variable.

The maturity or repricing profile is defined as the difference between assets and liabilities that will reprice or mature within one year. The higher this variable, the stronger the inverse relationship between interest rate changes and the market value of equity. Thus, maturity profile multiplied by the change in the 3-year treasury bill rate (INTGAP) is included as a control variable.

Liquidity (LIQ) is a relative measure of the net assets that can be converted into cash relatively quickly and costlessly. A bank with a relatively high percentage of its assets in liquid funds is also likely to be inefficient since it forgoes higher return opportunities. The liquidity variable is included to control for balance sheet composition and the implied inefficiency associated with having excessive liquidity.

A measure of capital constraint was also included to control for the way in which the market perceives the regulatory risk from binding capital constraints to affect bank value. Banks approaching the binding capital constraint may need to add capital in the future or face further constraints on future lending. These regulatory costs are capitalized in the market values of bank equity although not reported in book values.

The variable definitions and predicted effects on bank equity valuation are summarized in Table 4-1.

Data

The sample used in this study consists of 85 bank holding companies that filed Y-9 reports with the Federal Reserve, and were listed on the CRSP NYSE or NASDQ daily returns files. Of the original set of 102 banks, all observations were deleted for 17 banks due to missing data. This generated a balanced panel of 85 banks with 23 observations each. End of quarter stock prices and shares outstanding were obtained from the CRSP tapes.

The Y-9 disclosures of bank holding companies were used for several reasons. Banking firms with publicly traded stock are most often organized as holding companies. Since bank holding companies are frequently comprised of more than one bank, the use of Y-9 data circumvents the aggregation problems that arise when using FDIC Call Report data. Further, Y-9 reports have a more standardized format as opposed to footnotes to the financial statements; hence the classification and measurement of off-balance sheet activities are reported consistently across banks and across time. This is particularly advantageous when using quarterly data since interim financial reporting does not always provide this level of detail.

Results

In this section the results of three sets of analyses are presented. In the first section the results of examining the effect of commitment activity levels (nominal disclosures) on bank equity valuation are discussed. Separate models are estimated for small and large banks. The second section presents the effects of commitment disclosures on bank equity value when funding risk is considered. Finally, results from examining the effect of capital constraints on the relationship between commitment disclosures and bank equity value are discussed. Newey-West (cited in Greene 1993) consistent standard errors are reported in the tables along with ordinary least squares' standard errors, and White's (cited in Greene 1993) heteroscedasticity consistent standard errors. See Appendix B for further details on the Newey-West correction.

Information Content of Loan Commitment Disclosures

Equation 4.5 was estimated allowing the coefficients to shift between the pre and post-RBC periods. This was done for all variables due to the changes in economic environment as well as change in regulation. Estimation results are presented in Tables 4-4, 4-5, 4-6 and 4-7. In the pre-RBC period, the coefficient on TPGs is negative for both small and large banks (Tables 4-4 and 4-6) and is significantly more negative in the post-RBC period for large banks(α_9 = 0 in Table 4-6). The negative coefficient on TPG does not imply that such guarantees are value reducing. It is consistent with the expectation that when the value generated from fee revenues are excluded, the off-balance sheet part of the agreement has a negative net present value. The coefficient on TPG in the post-RBC period ($\alpha_2 + \alpha_{10}$) is reported in Tables 4-5 and 4-7. The finding of a downward shift in the TPG coefficient for large banks supports the contention that increased capital requirements make TPGs more costly for these banks.[14] Note that for large banks the coefficient on the CAP variable is negative in the pre-RBC period, suggesting that holding capital in excess of required is costly.

For small banks loan commitments have a positive coefficient in the pre- and post-RBC periods. However, the shift coefficient (α_{11}) is not significantly different from zero. This positive relationship between equity value and loan commitments is consistent with the expectation that loan commitments represent future value-generating loans and that RBC regulation did not impose additional costs on these activities.

For large banks loan commitments are positively related to bank equity value in the post-RBC period and is zero in the pre-RBC sample period (Tables 4-6 and 4-37). Since the economy has been on an upswing during the post-RBC period, a leading indicator (LEAD) was included in the model. This variable serves to reduce the potential for a correlated omitted variables problem. As discussed in the previous sections, large amounts of unexercised commitments may reflect excess capacity. On the other hand, if the economy is performing well (as is the case in the post-RBC period), large amounts of loan commitments could represent valuable lending opportunities. The coefficient on LEAD is positive in the post-RBC period, which contributes in explaining part of the increase in bank equity value during this period.

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[14] In addition to the fees on TPGs that banks earn from these customers, value is generated from other services associated with these same bank/customer relationships.

Funding Risk Results

This section discusses the results of examining contingent commitment valuation, allowing the coefficients on LC to vary under two different firm-specific attribute partitions.

Tables 4-8, 4-9, 4-10, and 4-11 present the results of allowing the value of LC to vary for high liquidity relative to total contingent commitments (LIQTCC). For small banks, the low funding risk (high LIQTCC) banks have a higher positive relationship between equity value and LCs. This is not the case for large banks.

Tables 4-12, 4-13, 4-14, and 4-15 present the results allowing LC value to vary based upon balance sheet maturity composition (GAPTA). The coefficient on the GAP interactive variable is significant for large but not small banks. For large banks, the greater the maturity mismatch of the banks' portfolio, the greater is the association between bank equity value and loan commitments. Large banks do not rely entirely upon liquidity of sources reported on the balance sheet to fund contingent commitments that are exercised, but rather use some combination of funds from existing loans that will be maturing, and existing liquidity. The differing results between small and large banks might reflect different funding models used by banks of different size.

Capital

Tables 4-16, 4-17, 4-18, and 4-19 present the results of estimating models using the interaction of a dummy variable for high and low capital with TPGs. The coefficient on TPG for low capital banks in the pre-RBC period (CDUM*TPG) is not significantly different from zero for neither small nor large banks (Tables 4-16 and 4-18). However, in the post-RBC period the relationship between TPG and equity value for low capital banks is less negative than for well capitalized banks (evidenced by a positive coefficient on CDUM*TPG*REG). This result is consistent with the notion that TPGs contribute to bank equity value by expropriating wealth from the FDIC.

Summary

The model developed in this paper illustrates that the potential contribution of contingent commitment disclosures in valuation exists in their ability to measure the off-balance sheet liability that is created when commitments are issued and borrower default and regulatory costs are nontrivial. The effect of these commitments on bank equity values decreases when the regulatory costs associated with issuing these commitments has increased. The two funding risk measures used, existing balance-sheet liquidity, and maturity profile, provide some insight into the valuation implications of contingent commitments.

Finally, risk-based capital rules were designed to reduce risk-taking by capital constrained banks. The results show that the requirements imposed by RBC is associated with a reduction in the value of third party guarantees, making them more costly for banks.

TABLE 4-1

Variable Definitions and Basic Regression Equation

MVE = Market value of equity

BVE = Book value of equity

TPG = Third party guarantees (standby and commercial letters of credit)

LC = Loan commitments

GAP = Assets maturing or repricing within one year less liabilities maturing or repricing within one year ÷ total assets

INTGAP = Change in 3-year treasury bill rate from previous quarter multiplied by GAP

LIQ = Liquidity ÷ total assets

LIQTCC = Liquidity ÷ total contingent commitments

CAP = (Actual capital - Required Capital)/Actual Capital

CDUM = Capital level dummy variable (CDUM=0 for high CAP; CDUM=1 for low CAP)

REG = Regulatory regime (REG=0 for pre-RBC period; REG=1 for post-RBC period)

LDUM = LIQTCC dummy variable (LDUM=0 for low LIQTCC; LDUM=0 for high LIQTCC)

$$
\begin{aligned}
\text{MVE} = {} & \alpha_0 + \alpha_1 \text{ BVE} + \alpha_2 \text{ TPG} + \alpha_3 \text{ LC} + \alpha_4 \text{ GAP} + \alpha_5 \text{ CAP} \\
& + \alpha_6 \text{ LIQ} + \alpha_7 \text{ REG} + \alpha_8 \text{ REG*BVE} + \alpha_9 \text{ REG*TPG} \\
& + \alpha_{10} \text{ REG*LC} + \alpha_{11} \text{ REG*GAP} + \alpha_{12} \text{ REG*CAP} \\
& + \alpha_{13} \text{ REG*LIQ} + \varepsilon_{10}.
\end{aligned}
$$

TABLE 4-2

Contingent Commitment Value Size Group Predictions[a]

	SMALL	LARGE
BVE	+	+
TPG	-	-
LC	+/-	+/-
CDUM*TPG	INS OPT: + FAILURE: -	INS OPT: + FAILURE: -
LDUM*LC	+	+
LIQ	-	-
TPG*REG	-	--
LC*REG	+/-	+/-

[a] Variable definitions are given in Table 4-1.

TABLE 4-3
Descriptive Statistics
Mean values by size and regulatory regime[a]

	SMALL PRE-RBC	SMALL POST-RBC	LARGE PRE-RBC	LARGE POST-RBC
N	304	266	376	329
TASST	2,208,602	3,007,269	22,325,213	30,272,129
BVE	153,207	216,587	1,148,674	1,642,210
TPG	38,457	51,510	2,122,907	2,547,626
TPG/TASST	0.016	0.016	0.055	0.055
LC	237,572	415,435	5,805,085	7,858,138
LC/TASST	0.101	0.127	0.212	0.229
CAP (MIN) (MAX)	0.299 0.018 0.627	0.547 0.089 0.832	0.255 0.024 0.515	0.448 -0.125 0.868
LIQTA	0.160	0.126	0.039	0.016
GAPTA	0.176	0.147	0.212	0.167

[a] Variable definitions are given in Table 4-1

TABLE 4-4

Contingent Commitment Value

Sample of 38 small bank holding companies[a]
(N=570)

$$MVE = \alpha_{0i} + \alpha_1\ BVE + \alpha_2\ TPG + \alpha_3\ LC + \alpha_4\ INTGAP + \alpha_5\ CAP + \alpha_6\ LIQ + \alpha_7\ LEAD + \alpha_8\ REG + \alpha_9\ BVE{*}REG + \alpha_{10}\ TPG{*}REG + \alpha_{11}\ LC{*}REG + \alpha_{12}\ CAP{*}REG + \alpha_{13}\ INTGAP{*}REG + \alpha_{14}\ LIQ{*}REG + \alpha_{15}\ LEAD{*}REG + \varepsilon_{11}.$$

ADJ $R^2 = 0.531$

	Parameter Estimate	O.L.S. S.E.	White's S.E.	Newey-West S.E.
BVE	1.259[b]	0.122	0.147	0.160
TPG	-2.449[b]	0.200	0.190	0.283
LC	0.124[b]	0.092	0.190	0.051
INTGAP	0.036[b]	0.092	0.010	0.010
CAP	133783[b]	41802.550	47627.207	65838.666
LIQ	-1026.129	938.528	890.291	1776.590
LEAD	-0.005[b]	0.0008	0.0008	0.002
REG	-2.449[b]	0.092	0.242	0.343
BVE*REG	-0.161[c]	0.092	0.102	0.018
TPG*REG	0.339	0.202	0.227	0.053
LC*REG	-0.035	0.030	0.190	0.053
CAP*REG	45447	46034.48	50711.499	66077.455
INTGAP*REG	-0.029[b]	0.011	0.016	0.012
LIQ*REG	-17492	44451.75	45001.359	54463.566
LEAD*REG	0.017[b]	0.00161	0.00167	0.0024

[a] Variable definitions are given in Table 4-1.

[b] Significant at the 95% level for a one-tailed t-test using Newey-West standard errors.

[c] Significant at the 90% level for a one-tailed t-test using Newey-West standard errors.

TABLE 4-5

Contingent Commitment Value

Post Risk-Based Capital Period
Coefficient Estimates

Sample of 38 small bank holding companies[a]
(N=570)

$$\begin{aligned} MVE = {} & \alpha_{0i} + \alpha_1 \text{ BVE} + \alpha_2 \text{ TPG} + \alpha_3 \text{ LC} + \alpha_4 \text{ INTGAP} + \alpha_5 \text{ CAP} + \alpha_6 \text{ LIQ} \\ & + \alpha_7 \text{ LEAD} + \alpha_8 \text{ REG} + \alpha_9 \text{ BVE*REG} + \alpha_{10} \text{ TPG*REG} + \alpha_{11} \text{ LC*REG} \\ & + \alpha_{12} \text{ CAP*REG} + \alpha_{13} \text{ INTGAP*REG} + \alpha_{14} \text{ LIQ*REG} \\ & + \alpha_{15} \text{ LEAD*REG} + \varepsilon_{11}. \end{aligned}$$

$$\alpha = (\alpha_m + \alpha_n).$$

$$\text{var}(\alpha_m + \alpha_n) = \text{var}(\alpha_m) + \text{var}(\alpha_n) + 2 \text{ cov}(\alpha_m, \alpha_n).$$

	Parameter Estimate	Newey-West S.E.
BVE $\alpha_1+\alpha_9$	1.242^b	0.123
TPG $\alpha_2+\alpha_{10}$	-0.149	0.230
LC $\alpha_3+\alpha_{11}$	0.089^b	0.021
INTGAP $\alpha_4+\alpha_{13}$	-0.036^b	0.007
CAP $\alpha_5+\alpha_{12}$	179230^b	16338.91
LIQ $\alpha_6+\alpha_{14}$	-18518.129	54579.10
LEAD $\alpha_7+\alpha_{15}$	0.012^c	0.009

[a] Variable definitions are given in Table 4-1.

[b] Significant at the 95% level for a one-tailed t-test using Newey-West standard errors.

[c] Significant at the 90% level for a one-tailed t-test using Newey-West standard errors.

TABLE 4-6

Contingent Commitment Value

Sample of 47 large bank holding companies[a]
(N=705)

$$MVE = \alpha_{0i} + \alpha_1 BVE + \alpha_2 TPG + \alpha_3 LC + \alpha_4 INTGAP + \alpha_5 CAP + \alpha_6 LIQ + \alpha_7 LEAD + \alpha_8 REG + \alpha_9 BVE*REG + \alpha_{10} TPG*REG + \alpha_{11} LC*REG + \alpha_{12} CAP*REG + \alpha_{13} INTGAP*REG + \alpha_{14} LIQ*REG + \alpha_{15} LEAD*REG + \varepsilon_{11}.$$

ADJ $R^2 = 0.571$

	Parameter Estimate	O.L.S. S.E.	White's S.E.	Newey-West S.E.
BVE	0.380[b]	0.085	0.174	0.184
TPG	-0.096[b]	0.041	0.006	0.008
LC	1.910	0.003	0.014	0.015
INTGAP	0.043[b]	0.009	0.006	0.008
CAP	-1448614[b]	397977.597	412115.755	548917.116
LIQ	-112835	51488.889	52997.822	96840.178
LEAD	0.003	0.007	0.006	0.017
REG	-12.734[b]	1.910	0.086	2.761
BVE*REG	0.538[b]	0.077	0.131	0.146
TPG*REG	-0.228[b]	0.020	0.039	0.039
LC*REG	0.032[b]	0.009	0.039	0.015
CAP*REG	3154837[b]	404579.561	477699.927	583429.516
INTGAP*REG	-0.046[b]	0.009	0.012	0.010
LIQ*REG	747019[b]	36758.524	370462.657	395550.250
LEAD*REG	0.077[b]	0.013	0.014	0.019

[a] Variable definitions are given in Table 4-1.

[b] Significant at the 95% level for a one-tailed t-test using Newey-West standard errors.

TABLE 4-7

Contingent Commitment Value

Post Risk-Based Capital Period
Coefficient Estimates

Sample of 47 large bank holding companies[a]
(N=705)

$$MVE = \alpha_{0i} + \alpha_1 \text{ BVE} + \alpha_2 \text{ TPG} + \alpha_3 \text{ LC} + \alpha_4 \text{ INTGAP} + \alpha_5 \text{ CAP} + \alpha_6 \text{ LIQ} + \alpha_7 \text{ LEAD} + \alpha_8 \text{ REG} + \alpha_9 \text{ BVE*REG} + \alpha_{10} \text{ TPG*REG} + \alpha_{11} \text{ LC*REG} + \alpha_{12} \text{ CAP*REG} + \alpha_{13} \text{ INTGAP*REG} + \alpha_{14} \text{ LIQ*REG} + \alpha_{15} \text{ LEAD*REG} + \varepsilon_{11}.$$

$$\alpha = (\alpha_m + \alpha_n).$$

$$\text{var}(\alpha_m + \alpha_n) = \text{var}(\alpha_m) + \text{var}(\alpha_n) + 2 \text{ cov}(\alpha_m, \alpha_n).$$

	Parameter Estimate	Newey-West S.E.
BVE $\alpha_1+\alpha_9$	0.918[b]	0.117
TPG $\alpha_2+\alpha_{10}$	-0.324[b]	0.055
LC $\alpha_3+\alpha_{11}$	0.050[b]	0.013
INTGAP $\alpha_4+\alpha_{13}$	-0.003	0.007
CAP $\alpha_5+\alpha_{12}$	1706223[b]	251992
LIQ $\alpha_6+\alpha_{14}$	634184[b]	373199.7
LEAD $\alpha_7+\alpha_{15}$	0.080[b]	0.008

[a] Variable definitions are given in Table 4-1.

[b] Significant at the 95% level for a one-tailed t-test using Newey-West standard errors.

TABLE 4-8

Contingent Commitment Value

FUNDING RISK: LIQUIDITY
Sample of 38 small bank holding companies[a]
(N=570)

$$MVE = \alpha_{0i} + \alpha_1\ BVE + \alpha_2\ TPG + \alpha_3\ LC + \alpha_4\ INTGAP + \alpha_5\ CAP + \alpha_6\ LIQ + \alpha_7\ LDUM{*}LC + \alpha_8\ REG + \alpha_9\ BVE{*}REG + \alpha_{10}\ TPG{*}REG + \alpha_{11}\ LC{*}REG + \alpha_{12}\ CAP{*}REG + \alpha_{13}\ INTGAP{*}REG + \alpha_{14}\ LIQ{*}REG + \alpha_{15}\ LDUM{*}LC{*}REG + \varepsilon_{12}.$$

LDUM=0 for low LIQTCC; LDUM=1 for high LIQTCC

ADJ R^2 = 0.454

	Parameter Estimate	O.L.S. S.E.	White's S.E.	Newey-West S.E.
BVE	1.051[b]	0.125	0.137	0.159
TPG	-0.381[c]	0.216	0.040	0.283
LC	0.117[b]	0.034	0.040	0.050
INTGAP	0.024[b]	0.008	0.010	0.113
CAP	119760[b]	45481.192	48695.632	63265.710
LIQ	133.084	991.632	924.179	1905.809
LDUM*LC	0.148[b]	0.088	0.075	0.003
REG	-0.075	0.008	0.018	0.420
BVE*REG	0.012	0.008	0.111	0.113
TPG*REG	0.083	0.217	0.236	0.289
LC*REG	-0.035	0.034	0.042	0.052
CAP*REG	-26847	49252.58	50292.818	63397.319
INTGAP*REG	-0.037[b]	0.011	0.016	0.012
LIQ*REG	103633[b]	54483.325	54342.228	50128.834
LDUM*LC*REG	-0.038[b]	0.010	0.010	0.003

[a] Variable definitions are given in Table 4-1.

[b] Significant at the 95% level for a one-tailed t-test using Newey-West standard errors.

[c] Significant at the 90% level for a one-tailed t-test using Newey-West standard errors.

TABLE 4-9

Contingent Commitment Value

FUNDING RISK: LIQUIDITY
Post Risk-Based Capital Period
Coefficient Estimates

Sample of 38 small bank holding companies[a]
(N=570)

$$MVE = \alpha_{0i} + \alpha_1\ BVE + \alpha_2\ TPG + \alpha_3\ LC + \alpha_4\ INTGAP + \alpha_5\ CAP + \alpha_6\ LIQ + \alpha_7\ LDUM*LC + \alpha_8\ REG + \alpha_9\ BVE*REG + \alpha_{10}\ TPG*REG + \alpha_{11}\ LC*REG + \alpha_{12}\ CAP*REG + \alpha_{13}\ INTGAP*REG + \alpha_{14}\ LIQ*REG + \alpha_{15}\ LDUM*LC*REG + \varepsilon_{12}.$$

LDUM=0 for low LIQTCC; LDUM=1 for high LIQTCC

$$\alpha = (\alpha_m + \alpha_n).$$

$$var(\alpha_m + \alpha_n) = var(\alpha_m) + var(\alpha_n) + 2\ cov(\alpha_m, \alpha_n).$$

	Parameter Estimate	Newey-West S.E.
BVE $\alpha_1+\alpha_9$	1.063[b]	0.129
TPG $\alpha_2+\alpha_{10}$	-0.298	0.240
LC $\alpha_3+\alpha_{11}$	0.082[b]	0.022
INTGAP $\alpha_4+\alpha_{13}$	-0.013[b]	0.007
CAP $\alpha_5+\alpha_{12}$	92913[b]	17133.88
LIQ $\alpha_6+\alpha_{14}$	103766.085[b]	50100.05
LDUM*LC $\alpha_7+\alpha_{15}$	0.110[b]	0.001

[a] Variable definitions are given in Table 4-1.

[b] Significant at the 95% level for a one-tailed t-test using Newey-West standard errors.

TABLE 4-10

FUNDING RISK: LIQUIDITY

Contingent Commitment Value
Sample of 47 large bank holding companies[a]
(N=705)

$$MVE = \alpha_{0i} + \alpha_1 BVE + \alpha_2 TPG + \alpha_3 LC + \alpha_4 INTGAP + \alpha_5 CAP + \alpha_6 LIQ + \alpha_7 LDUM*LC + \alpha_8 REG + \alpha_9 BVE*REG + \alpha_{10} TPG*REG + \alpha_{11} LC*REG + \alpha_{12} CAP*REG + \alpha_{13} INTGAP*REG + \alpha_{14} LIQ*REG + \alpha_{15} LDUM*LC*REG + \varepsilon_{12}.$$

LDUM=0 for low LIQTCC; LDUM=1 for high LIQTCC

ADJ R^2 = 0.542

	Parameter Estimate	O.L.S. S.E.	White's S.E.	Newey-West S.E.
BVE	0.044[b]	0.088	0.175	0.191
TPG	-0.114[b]	0.042	0.061	0.008
LC	0.027[b]	0.013	0.006	0.016
INTGAP	0.044[b]	0.008	0.006	0.008
CAP	-1649810[b]	393204.744	403660.455	499669.891
LIQ	-116457[b]	51930.324	54997.840	66548.779
LDUM*LC	-0.046	0.044	0.033	0.008
REG	-1.557[b]	0.132	0.197	0.227
BVE*REG	0.534[b]	0.081	0.142	0.162
TPG*REG	-0.227[b]	0.021	0.041	0.008
LC*REG	0.030[b]	0.010	0.004	0.016
CAP*REG	2953261[b]	401617.650	466800.289	559598.070
INTGAP*REG	-0.056[b]	0.009	0.012	0.010
LIQ*REG	411835	446115.322	488094.088	454455.718
LDUM*LC*REG	0.012[b]	0.005	0.005	0.005

[a] Variable definitions are given in Table 4-1.

[b] Significant at the 95% level for a one-tailed t-test using Newey-West standard errors.

TABLE 4-11

Contingent Commitment Value

FUNDING RISK: LIQUIDITY
Post Risk-Based Capital Period
Coefficient Estimates

Sample of 47 large bank holding companies[a]
(N=705)

$$MVE = \alpha_{0i} + \alpha_1 \, BVE + \alpha_2 \, TPG + \alpha_3 \, LC + \alpha_4 \, INTGAP + \alpha_5 \, CAP + \alpha_6 \, LIQ + \alpha_7 \, LDUM^* \, LC + \alpha_8 \, REG + \alpha_9 \, BVE^*REG + \alpha_{10} \, TPG^*REG + \alpha_{11} \, LC^*REG + \alpha_{12} \, CAP^*REG + \alpha_{13} \, INTGAP^*REG + \alpha_{14} \, LIQ^*REG + \alpha_{15} \, LDUM^*LC^*REG + \varepsilon_{12}.$$

LDUM=0 for low LIQTCC; LDUM=1 for high LIQTCC

$$\alpha = (\alpha_m + \alpha_n).$$

$$var(\alpha_m + \alpha_n) = var(\alpha_m) + var(\alpha_n) + 2 \, cov(\alpha_m, \alpha_n).$$

	Parameter Estimate	Newey-West S.E.
BVE $\alpha_1+\alpha_9$	0.953[b]	0.119
TPG $\alpha_2+\alpha_{10}$	-0.341[b]	0.057
LC $\alpha_3+\alpha_{11}$	0.056[b]	0.014
INTGAP $\alpha_4+\alpha_{13}$	-0.012[b]	0.057
CAP $\alpha_5+\alpha_{12}$	1303451[b]	233280.9
LIQ $\alpha_6+\alpha_{14}$	295378	438568.7
LDUM*LC $\alpha_7+\alpha_{15}$	-0.034	0.039

[a] Variable definitions are given in Table 4-1.

[b] Significant at the 95% level for a one-tailed t-test using Newey-West standard errors.

TABLE 4-12

Contingent Commitment Value

FUNDING RISK: MATURITY PROFILE
Sample of 38 small bank holding companies[a]
(N=570)

$$MVE = \alpha_{0i} + \alpha_1\ BVE + \alpha_2\ TPG + \alpha_3\ LC + \alpha_4\ INTGAP + \alpha_5\ CAP + \alpha_6\ LIQ + \alpha_7\ GDUM{*}LC + \alpha_8\ REG + \alpha_9\ BVE{*}REG + \alpha_{10}\ TPG{*}REG + \alpha_{11}\ LC{*}REG + \alpha_{12}\ CAP{*}REG + \alpha_{13}\ INTGAP{*}REG + \alpha_{14}\ LIQ{*}REG + \alpha_{15}\ GDUM{*}LC{*}REG + \varepsilon_{13}.$$

GDUM=0 for low GAPTA; GDUM=1 for high GAPTA

ADJ $R^2 = 0.441$

	Parameter Estimate	O.L.S. S.E.	White's S.E.	Newey-West S.E.
BVE	1.130[b]	0.128	0.129	0.154
TPG	-0.453[c]	0.218	0.208	0.294
LC	0.095[b]	0.035	0.036	0.045
INTGAP	0.025[b]	0.018	0.010	0.009
CAP	91046[c]	45484.743	49797.638	67408.679
LIQ	112.826	1003.405	938.703	1156.619
GDUM*LC	0.021	0.026	0.029	0.114
REG	-0.079[b]	0.018	0.018	0.022
BVE*REG	-0.051	0.118	0.118	0.114
TPG*REG	0.143	0.221	0.247	0.291
LC*REG	-0.020	0.038	0.042	0.048
CAP*REG	7265.038	49087.865	50789.966	68124.592
INTGAP*REG	-0.035[b]	0.011	0.017	0.011
LIQ*REG	-339.986	48454.15	49708.354	57300.436
GDUM*LC*REG	0.0003	0.003	0.004	0.0043

[a] Variable definitions are given in Table 4-1.

[b] Significant at the 95% level for a one-tailed t-test using Newey-West standard errors.

[c] Significant at the 90% level for a one-tailed t-test using Newey-West standard errors.

TABLE 4-13

Contingent Commitment Value

FUNDING RISK: MATURITY PROFILE
Post Risk-Based Capital Period
Coefficient Estimates

Sample of 38 small bank holding companies[a]
(N=570)

$$MVE = \alpha_{0i} + \alpha_1 \text{ BVE} + \alpha_2 \text{ TPG} + \alpha_3 \text{ LC} + \alpha_4 \text{ INTGAP} + \alpha_5 \text{ CAP} + \alpha_6 \text{ LIQ} + \alpha_7 \text{ GDUM*LC} + \alpha_8 \text{ REG} + \alpha_9 \text{ BVE*REG} + \alpha_{10} \text{ TPG*REG} + \alpha_{11} \text{ LC*REG} + \alpha_{12} \text{ CAP*REG} + \alpha_{13} \text{ INTGAP*REG} + \alpha_{14} \text{ LIQ*REG} + \alpha_{15} \text{ GDUM*LC*REG} + \varepsilon_{13}.$$

GDUM=0 for low GAPTA; GDUM=1 for high GAPTA

$$\alpha = (\alpha_m + \alpha_n).$$

$$\text{var}(\alpha_m + \alpha_n) = \text{var}(\alpha_m) + \text{var}(\alpha_n) + 2 \text{ cov}(\alpha_m, \alpha_n).$$

	Parameter Estimate	Newey-West S.E.
BVE $\alpha_1+\alpha_9$	1.079[b]	0.125
TPG $\alpha_2+\alpha_{10}$	-0.310[c]	0.235
LC $\alpha_3+\alpha_{11}$	0.075[b]	0.0[illegible]7
INTGAP $\alpha_4+\alpha_{13}$	-0.010[c]	0.007
CAP $\alpha_5+\alpha_{12}$	98311.038[b]	14397.56
LIQ $\alpha_6+\alpha_{14}$	-227.160	57510.91
GDUM*LC $\alpha_7+\alpha_{15}$	0.022	0.039

[a] Variable definitions are given in Table 4-1.

[b] Significant at the 95% level for a one-tailed t-test using Newey-West standard errors.

[c] Significant at the 90% level for a one-tailed t-test using Newey-West standard errors.

TABLE 4-14

Contingent Commitment Value

FUNDING RISK: MATURITY PROFILE
Sample of 47 large bank holding companies[a]
(N=705)

$$MVE = \alpha_{0i} + \alpha_1 BVE + \alpha_2 TPG + \alpha_3 LC + \alpha_4 INTGAP + \alpha_5 CAP + \alpha_6 LIQ + \alpha_7 GDUM*LC + \alpha_8 REG + \alpha_9 BVE*REG + \alpha_{10} TPG*REG + \alpha_{11} LC*REG + \alpha_{12} CAP*REG + \alpha_{13} INTGAP*REG + \alpha_{14} LIQ*REG + \alpha_{15} GDUM*LC*REG + \varepsilon_{13}.$$

GDUM=0 for low GAPTA; GDUM=1 for high GAPTA

ADJ R^2 = 0.551

	Parameter Estimate	O.L.S. S.E.	White's S.E.	Newey-West S.E.
BVE	0.414[b]	0.087	0.171	0.180
TPG	-0.145[b]	0.043	0.059	0.0[illegible]8
LC	0.007	0.014	0.016	0.018
INTGAP	0.045[b]	0.006	0.006	0.008
CAP	-1484181[b]	385759.052	393014.359	491548.573
LIQ	-121588[b]	51364.949	54680.109	65516.334
GDUM*LC	0.017[b]	0.006	0.006	0.010
REG	-1.482[b]	0.129	0.189	0.207
BVE*REG	0.578[b]	0.087	0.137	0.148
TPG*REG	-0.263[b]	0.022	0.044	0.044
LC*REG	0.052[b]	0.011	0.016	0.019
CAP*REG	2787083[b]	394960.656	447848.119	528639.764
INTGAP*REG	-0.068[b]	0.010	0.013	0.010
LIQ*REG	907683[b]	376494.460	370501.647	395712.017
GDUM*LC*REG	-0.004[b]	0.001	0.0011	0.0012

[a] Variable definitions are given in Table 4-1.

[b] Significant at the 95% level for a one-tailed t-test using Newey-West standard errors.

TABLE 4-15

Contingent Commitment Value

FUNDING RISK: MATURITY PROFILE
Post Risk-Based Capital Period
Coefficient Estimates

Sample of 47 large bank holding companies[a]
(N=705)

$$MVE = \alpha_{0i} + \alpha_1\ BVE + \alpha_2\ TPG + \alpha_3\ LC + \alpha_4\ INTGAP + \alpha_5\ CAP + \alpha_6\ LIQ + \alpha_7\ GDUM*LC + \alpha_8\ REG + \alpha_9\ BVE*REG + \alpha_{10}\ TPG*REG + \alpha_{11}\ LC*REG + \alpha_{12}\ CAP*REG + \alpha_{13}\ INTGAP*REG + \alpha_{14}\ LIQ*REG + \alpha_{15}\ GDUM*LC*REG + \varepsilon_{13}.$$

GDUM=0 for low GAPTA; GDUM=1 for high GAPTA

$$\alpha = (\alpha_m + \alpha_n).$$

$$var(\alpha_m + \alpha_n) = var(\alpha_m) + var(\alpha_n) + 2\ cov(\alpha_m,\alpha_n).$$

	Parameter Estimate	Newey-West S.E.
BVE $\alpha_1+\alpha_9$	0.992[b]	0.111
TPG $\alpha_2+\alpha_{10}$	-0.093[c]	0.058
LC $\alpha_3+\alpha_{11}$	0.060[b]	0.014
INTGAP $\alpha_4+\alpha_{13}$	-0.023[b]	0.014
CAP $\alpha_5+\alpha_{12}$	1302902[b]	226892
LIQ $\alpha_6+\alpha_{14}$	786095[b]	375438.9
GDUM*LC $\alpha_7+\alpha_{15}$	0.013[c]	0.009

[a] Variable definitions are given in Table 4-1.

[b] Significant at the 95% level for a one-tailed t-test using Newey-West standard errors.

[c] Significant at the 90% level for a one-tailed t-test using Newey-West standard errors.

TABLE 4-16

Contingent Commitment Value

CAPITAL CONSTRAINED
Sample of 38 small bank holding companies[a]
(N=570)

$$MVE = \alpha_{0i} + \alpha_1\ BVE + \alpha_2\ TPG + \alpha_3\ LC + \alpha_4\ INTGAP + \alpha_5\ CAP + \alpha_6\ LIQ + \alpha_7\ CDUM{*}TPG + \alpha_8\ REG + \alpha_9\ BVE{*}REG + \alpha_{10}\ TPG{*}REG + \alpha_{11}\ LC{*}REG + \alpha_{12}\ CAP{*}REG + \alpha_{13}\ INTGAP{*}REG + \alpha_{14}\ LIQ{*}REG + \alpha_{15}\ CDUM{*}TPG{*}REG + \varepsilon_{14}.$$

CDUM=1 for low CAP; CDUM=0 for high CAP

ADJ $R^2 = 0.446$

	Parameter Estimate	O.L.S. S.E.	White's S.E.	Newey-West S.E.
BVE	1.086[b]	0.020	0.133	0.163
TPG	-0.395[c]	0.218	0.010	0.304
LC	0.112[b]	0.033	0.037	0.050
INTGAP	1.086[b]	0.008	0.010	0.304
CAP	49364	48039.932	48014.975	67155.938
LIQ	156.743	999.172	927.493	1136.576
CDUM*TPG	-0.050	0.020	0.025	0.049
REG	-0.085[b]	0.018	0.018	0.022
BVE*REG	-0.076	0.099	0.106	0.120
TPG*REG	0.096	0.220	0.241	0.296
LC*REG	-0.017	0.033	0.040	0.052
CAP*REG	47086	51704.298	48948.149	68132.08
INTGAP*REG	-0.036[b]	0.011	0.015	0.011
LIQ*REG	-8967.457	48541.814	49135.780	58275.724
CDUM*TPG*REG	0.126	0.703	0.408	0.564

[a] Variable definitions are given in Table 4-1.

[b] Significant at the 95% level for a one-tailed t-test using Newey-West standard errors.

[c] Significant at the 90% level for a one-tailed t-test using Newey-West standard errors.

TABLE 4-17

Contingent Commitment Value

CAPITAL CONSTRAINED
Post Risk-Based Capital Period
Coefficient Estimates

Sample of 38 small bank holding companies[a]
(N=570)

$$MVE = \alpha_{0i} + \alpha_1 \text{ BVE} + \alpha_2 \text{ TPG} + \alpha_3 \text{ LC} + \alpha_4 \text{ INTGAP} + \alpha_5 \text{ CAP} + \alpha_6 \text{ LIQ} + \alpha_7 \text{ CDUM*TPG} + \alpha_8 \text{ REG} + \alpha_9 \text{ BVE*REG} + \alpha_{10} \text{ TPG*REG} + \alpha_{11} \text{ LC*REG} + \alpha_{12} \text{ CAP*REG} + \alpha_{13} \text{ INTGAP*REG} + \alpha_{14} \text{ LIQ*REG} + \alpha_{15} \text{ CDUM*TPG*REG} + \varepsilon_{14}.$$

CDUM=1 for low CAP; CDUM=0 for high CAP

$$\alpha = (\alpha_m + \alpha_n).$$

$$\text{var}(\alpha_m + \alpha_n) = \text{var}(\alpha_m) + \text{var}(\alpha_n) + 2 \text{ cov}(\alpha_m, \alpha_n).$$

	Parameter Estimate	Newey-West S.E.
BVE $\alpha_1+\alpha_9$	1.011[b]	0.114
TPG $\alpha_2+\alpha_{10}$	-0.299[c]	0.234
LC $\alpha_3+\alpha_{11}$	0.095[b]	0.023
INTGAP $\alpha_4+\alpha_{13}$	-0.012[b]	0.007
CAP $\alpha_5+\alpha_{12}$	96450[b]	14815.53
LIQ $\alpha_6+\alpha_{14}$	-8810.714	59997.17
CDUM*TPG $\alpha_7+\alpha_{15}$	0.076	0.519

[a] Variable definitions are given in Table 4-1.

[b] Significant at the 95% level for a one-tailed t-test using Newey-West standard errors.

[c] Significant at the 90% level for a one-tailed t-test using Newey-West standard errors.

TABLE 4-18

Contingent Commitment Value

CAPITAL CONSTRAINED
Sample of 47 large bank holding companies[a]
(N=705)

$$MVE = \alpha_{0i} + \alpha_1\ BVE + \alpha_2\ TPG + \alpha_3\ LC + \alpha_4\ INTGAP + \alpha_5\ CAP + \alpha_6\ LIQ + \alpha_7\ CDUM{*}TPG + \alpha_8\ REG + \alpha_9\ BVE{*}REG + \alpha_{10}\ TPG{*}REG + \alpha_{11}\ LC{*}REG + \alpha_{12}\ CAP{*}REG + \alpha_{13}\ INTGAP{*}REG + \alpha_{14}\ LIQ{*}REG + \alpha_{15}\ CDUM{*}TPG{*}REG + \varepsilon_{14}.$$

CDUM=1 for low CAP; CDUM=0 for high CAP

ADJ R^2 = 0.540

	Parameter Estimate	O.L.S. S.E.	White's S.E.	Newey-West S.E.
BVE	0.429[b]	0.092	0.170	0.149
TPG	-0.120[b]	0.043	0.064	0.059
LC	0.021[c]	0.013	0.006	0.016
INTGAP	0.045[b]	0.006	0.006	0.059
CAP	-1677395[b]	403136.686	387987.107	507956.691
LIQ	-119531[b]	51986.883	54252.40	65924.502
CDUM*TPG	0.001	0.001	0.002	0.059
REG	-1.579[b]	0.135	0.198	0.234
BVE*REG	0.561[b]	0.081	0.198	0.149
TPG*REG	-0.230[b]	0.021	0.190	0.041
LC*REG	0.028[b]	0.010	0.013	0.016
CAP*REG	3070263[b]	417385.235	455760.868	568647.518
INTGAP*REG	-0.055[b]	0.009	0.012	0.010
LIQ*REG	974663[b]	380948.413	374506.186	387104.637
CDUM*TPG*REG	0.176[b]	0.101	0.141	0.084

[a] Variable definitions are given in Table 4-1.

[b] Significant at the 95% level for a one-tailed t-test using Newey-West standard errors.

[c] Significant at the 90% level for a one-tailed t-test using Newey-West standard errors.

TABLE 4-19

Contingent Commitment Value

CAPITAL CONSTRAINED
Post Risk-Based Capital Period
Coefficient Estimates[a]

Sample of 47 large bank holding companies
(N=705)

$$MVE = \alpha_{0i} + \alpha_1 BVE + \alpha_2 TPG + \alpha_3 LC + \alpha_4 INTGAP + \alpha_5 CAP + \alpha_6 LIQ + \alpha_7 CDUM*TPG + \alpha_8 REG + \alpha_9 BVE*REG + \alpha_{10} TPG*REG + \alpha_{11} LC*REG + \alpha_{12} CAP*REG + \alpha_{13} INTGAP*REG + \alpha_{14} LIQ*REG + \alpha_{15} CDUM*TPG*REG + \varepsilon_{14}.$$

CDUM=1 for low CAP; CDUM=0 for high CAP

$$\alpha = (\alpha_m + \alpha_n).$$

$$var(\alpha_m + \alpha_n) = var(\alpha_m) + var(\alpha_n) + 2 cov(\alpha_m, \alpha_n).$$

	Parameter Estimate	Newey-West S.E.
BVE $\alpha_1+\alpha_9$	0.990[b]	0.115
TPG $\alpha_2+\alpha_{10}$	-0.350[b]	0.058
LC $\alpha_3+\alpha_{11}$	0.048[b]	0.013
INTGAP $\alpha_4+\alpha_{13}$	-0.011[c]	0.007
CAP $\alpha_5+\alpha_{12}$	1392871[b]	246941
LIQ $\alpha_6+\alpha_{14}$	855132[b]	368549.9
CDUM*TPG $\alpha_7+\alpha_{15}$	0.175[b]	0.084

[a] Variable definitions are given in Table 4-1.

[b] Significant at the 95% level for a one-tailed t-test using Newey-West standard errors.

[c] Significant at the 90% level for a one-tailed t-test using Newey-West standard errors.

CHAPTER 5
CONTINGENT COMMITMENTS AND THEIR CONTRIBUTION TO EQUITY RISK

Introduction

In chapter 4 of this dissertation it was found that the levels of third party guarantees and outstanding loan commitments are correlated with the market value of the issuing bank. This chapter examines the relationship between the disclosures of these two off-balance sheet activities and the *riskiness* of the issuing banks' stock.

Risk-based capital regulations require banks to hold capital relative to their assessed level of credit risk for balance sheet and off-balance sheet activities. This study examines the association between LCs, TPGs and equity risk, and whether risk-based capital requirements changed the way in which these activities are related to both systematic and total equity risk. Evidence is found that is consistent with the belief that there is a negative relationship between third party guarantees and equity risk. Further, the imposition of risk-based capital (RBC) did not significantly change the relationship between TPGs and bank risk. Loan commitments are found to be negatively related to the risk of large banks before RBC. However, after risk-based capital the association between equity risk and loan commitments is not significantly different from zero.

The analysis of chapter 3 finds that banks with higher balance sheet risk have higher levels of third party guarantees. This is consistent with the moral hazard hypothesis that proposes that risky banks issue third party guarantees to further increase equity risk, and results in wealth transfers from the FDIC to equityholders. Implicit to this argument is the assumption that TPGs are risk-increasing activities. Loan commitments (LCs) and third party guarantees (TPGs) have the potential to expose banks to interest rate, credit, and liquidity risks. Whether these off-balance sheet activities affect the risk of a bank's stock is an empirical question. Previous studies in this area have found conflicting results.

Risk-based capital rules were intended to require banks to hold capital based on their assessed level of credit risk. Since it is believed that off-balance sheet activities bear credit risk, additional capital must be held against them. This analysis addresses whether the level of off-balance sheet contingent commitments is positively related to bank equity risk when banks are required to hold capital against these activities.

This chapter is organized as follows. First, a brief discussion of the components of bank risk and the risk implications of TPGs and LCs is provided. Next, a discussion of the impact of risk-based capital requirements on the relationship between TPGs, LCs and risk is given. The following sections present the empirical tests and a discussion of the results. The final section concludes the chapter.

Off-Balance Sheet Activity and Bank Risk

Firm risk has been shown to consist of both operating and financial risk. Operating risk is associated with the variability of cash flows while financial risk is a function of leverage (Hamada 1972). Operating risk for banks can be broken down into credit, interest rate, and liquidity risks (Sinkey 1989). Balance sheet credit risk is primarily attributed to the quality of the loan portfolio and increases the expected losses from default. This increases operating risk by decreasing revenues and increasing costs. Interest rate risk is the risk that unexpected changes in interest rates will adversely affect the bank's interest income. A high degree of mismatching of the asset and liability portfolio has the potential to expose the bank to a higher degree of variability of its interest revenues and costs. This has been shown to be priced by the market (Flannery and James 1984). Liquidity risk consists of a pricing and an availability component. Availability is related to whether liquid funds can be acquired when needed, and pricing is associated with the costs of storing liquidity in the balance sheet. Therefore, credit, interest rate, and liquidity risk are the primary components of a bank's operating risk.

Off-balance sheet activities generate fee income which can help to reduce the difference between noninterest income and noninterest expense (Sinkey 1989, p 401). This potential reduction in operating risk from fee revenues is not the only risk implication associated with these activities. Contingent commitments also have the potential to increase the financial risk of the bank.

Third party guarantees are put options issued by the bank. They are exercised when the bank customer defaults on a contractual obligation to a third party. Standby letters of credit are an example of these types of guarantees. With these arrangements a bank adopts the payments on a defaulted loan, hence the associated credit risk is potentially quite high. In addition, these guarantees may expose banks to both liquidity risk and interest rate risk when they are exercised and must be funded. Most importantly, prior to RBC banks were required to hold a fixed proportion of the value of balance sheet assets as capital. Therefore, off-balance sheet activities effectively allowed the bank to increase its financial leverage.

Third party guarantees have the potential to expose banks to higher levels of risk. However, the level of TPGs may actually be inversely related to equity risk. James

(1988) posits that in the presence of fixed rate deposit insurance, banks have the incentive to use standby letters of credit to overcome the underinvestment problem. This is referred to as the *collateralization hypothesis*. Benveniste and Berger (1987) provide a similar argument showing that issuing secured loans with recourse can result in wealth transfers from the FDIC to equityholders. Both Benveniste and Berger (1987) and James (1988) predict that banks will choose to keep risky loans on the balance sheet and keep low risk loans off-balance sheet.

The underlying intuition behind this hypothesis is as follows. When a bank fails the FDIC pays off the insured depositors. The assets of the bank are then shared between the FDIC and uninsured depositors. If the bank's outstanding loans are riskless, the FDIC insurance is worthless. Conversely, the riskier the loan portfolio, the more valuable the FDIC insurance. In the presence of risky debt, (i.e. when there is some probability that the bank will not be able to honor its obligations to depositors) the bank will choose not to invest in new loans because this would result in a reduced probability of bank failure and/or increased cash flows. This reduced uncertainty results in wealth transfers from stockholders to the FDIC. This situation is analogous to Myers' (1977) underinvestment problem.

The only circumstance in which it would be in the stockholders' interest to issue these loans would be when the investment (i.e the loan) does not reduce the risk borne by bondholders or the FDIC. This is achieved by issuing debt that is senior to existing debt. This is accomplished when the bank takes low risk loans and arranges for uninsured depositors to fund the loan. The bank then provides the uninsured depositor with a third party guarantee against this loan. The bank has essentially issued a secured loan that is senior to existing debt. If the borrower defaults on the loan and the bank fails, the uninsured depositor becomes an additional claimant on the assets of the bank for the losses that exceed recoveries from the borrower. This allows banks to keep risky loans on the balance sheet and to maximize the value of deposit insurance. At the same time the bank is able to generate profits by issuing guarantees on safe loans that are kept off-balance sheet. The partitioning of low and high risk loans between the balance sheet and off-balance sheet is what drives this model.[1]

Brewer and Koppenhaver (1992) examined 100 bank holding companies for the period 1979 through 1986. They find evidence consistent with the moral hazard hypothesis;

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[1] This model requires assumptions about the correlation of risks associated with the loans on and off-balance sheet. The more diversified the bank's balance sheet loan portfolio the lower the probability of default, therefore the lower the value to issuing secured loans.

standby letters of credit scaled by the market value of equity is positively related to both systematic and total risk. James (1988) finds conflicting results. He finds no relationship between the risk premium on large (uninsured) certificates of deposit and the volume of standby letters of credit issued for 58 banks during the period 1984 through 1986.

Loan commitments have not received as much attention as third party guarantees. Unlike TPGs, loan commitments contain a "material adverse change" clause, which reduces the bank's exposure to credit risk when the credit quality of the borrower changes. Similar to TPGs, LCs have the potential of exposing banks to both interest rate and liquidity risk. Prior to risk-based capital requirements, LCs also allowed banks to increase their effective financial leverage. Thus, one might expect LCs to also increase bank risk.

The Effect of Risk-Based Capital

Risk-based capital requirements were intended to tie required capital levels to the credit risk associated with the activities of the bank. Since third party guarantees are irrevocable agreements by the bank to fund the customer in cases of default, these agreements are viewed as riskier than revocable commitments. Accordingly, bank regulators imposed a higher requirement that as much as 7% of the face value of the commitment be held as capital.

Loan commitments typically contain a "material adverse change" clause and are viewed by regulators as bearing less credit risk than TPGs. Therefore, the capital required to be held for LCs is significantly lower than for TPGs. Since risk-based capital requirements forced banks to hold equity capital against these commitments, we would expect to observe a decrease in the relationship between third party guarantees and bank equity risk. Since loan commitments do not require as much capital to be held against them, it is expected that the RBC rules will not reduce the amount of risk associated with LCs to the same extent as with TPGs.

Empirical Tests

The effect of off-balance sheet activities on the returns to equityholders, and the risk to regulators can differ. Equityholders are compensated for undiversifiable risk, or the extent to which the firm's returns move with the market. Therefore, stockholders' primary concern is with factors that influence the extent to which a firm's stock moves with the market. However, bank regulators are concerned with the total risk, or variability of the banks' equity, because a higher variability of equity is associated with a higher probability of failure. For these reasons, two evaluations of bank risk are used in this study: volatility of bank stock returns and bank stock betas.

The general market model for stock returns is stated as

$$RET_{it} = \alpha_{it} + \beta_{it}\ MRET_t + e_{it1}, \qquad (5.1)$$

where

RET_{it} = the i^{th} bank's stock return in period t, and
$MRET_t$ = the market return for period t.

The "beta model" used in this study is directly analogous to the model used by Brewer and Koppenhaver (1992). They show that the effect of balance sheet and off-balance sheet characteristics on beta can be written as

$$\beta_t = b_0 + b_j \text{ balance sheet attributes} + b_k \text{ off-balance sheet attributes.} \qquad (5.2)$$

The bank balance sheet attributes that are believed to be determinants of systematic risk are leverage, credit risk, liquidity risk, and interest rate risk. The following equation is believed to capture the effects of these characteristics on bank betas:

$$\beta_t = b_0 + b_1\ LEVERAGE + b_2\ CREDIT\ RISK + b_3\ MATURITY + b_4\ LIQUIDITY + b_5\ TPG + b_6\ LC + b_7\ TPG*REG + b_8\ LC*REG + e_3, \qquad (5.3)$$

where

LEVERAGE = the ratio of total assets to the book value of equity;

CREDIT RISK = the ratio of the allowance for loan losses to total assets;
MATURITY = the absolute value of the ratio of short-term net assets repricing in less than one year divided by total assets;
LIQUIDITY = liquidity relative to total assets;
TPG = third party guarantees divided by total assets;
LC = loan commitments divided by total assets;
TPG*REG = regulatory shift variable for third party guarantees; and
LC*REG = regulatory shift variable for loan commitments.

The leverage variable is included because previous studies have shown that higher levels of financial leverage are positively related to beta (Hamada 1972).

Credit risk is intended to capture the effects of existing balance sheet lending activity on beta. Higher levels of credit risk are expected to be related to higher betas.

The absolute value of short-term repricing of net assets is included to control for interest rate risk. The higher the maturity mismatching of the bank's asset portfolio, the higher the expected interest rate risk exposure. Flannery and James (1984) show that interest sensitivity of stock returns is related to maturity composition of a bank's portfolio.

The proxy for liquidity risk is based on the IDC Financial Publishing Inc. (1988) liquidity variable. This variable attempts to measure existing liquid assets net of current obligations. The coefficient on liquidity can be positive or negative. If availability is of greater concern, the coefficient is expected to be negative since the more liquid the bank the lower is its availability risk. However, if pricing risk is more important, the coefficient on liquidity is expected to be negative.

Relative levels of third party guarantees (TPG) and loan commitments (LC) are the variables of interest in this study. Regulators have included these activities in determinations of required bank capital based on their assessed credit risk. A positive coefficient on TPG is consistent with the notion that these commitments increase risk, and a negative coefficient on TPG is consistent with both the collateralization hypothesis and reduction of operating risk through fee income. Loan commitments are assessed on average to bear lower levels of credit risk by regulators than third party guarantees. However, since loan commitments do not generate a high level of fee income there is little or no direct reduction in operating risk. If this is the case then we would expect to find that the coefficient on LC is lower than the coefficient on TPG. Regulatory shifts are included for TPG and LC to determine whether risk-based capital changed the way that they are associated with bank risk.

The "beta model" estimated in this study can be written as:

$$\begin{aligned} RET = \propto + (b_0 &+ b_1 \text{ LEVERAGE} + b_2 \text{ CREDIT RISK} \\ &+ b_3 \text{ MATURITY} + b_4 \text{ LIQUIDITY} \\ &+ b_5 \text{ TPG} + b_6 \text{ LC} + b_7 \text{ TPG*REG} \\ &+ b_8 \text{ LC*REG}) * \text{MRET} + e_4 \end{aligned} \qquad (5.4)$$

The factors that are believed to affect systematic risk are also expected to influence total risk. The primary difference between the two risk measures is that total risk includes diversifiable risk factors. The following regression equation is hypothesized to explain total risk:

$$\begin{aligned} \sigma^2 = \beta_0 &+ \beta_1 \text{ LEVERAGE} + \beta_2 \text{ CREDIT RISK} \\ &+ \beta_3 \text{ MATURITY} + \beta_4 \text{ LIQUIDITY} + \beta_5 \text{ TPG} \\ &+ \beta_6 \text{ LC} + \beta_7 \text{ TPG*REG} + \beta_8 \text{ LC*REG} + e_5. \end{aligned} \qquad (5.5)$$

Volatility of stock returns serves as a proxy for σ^2 and is calculated as the sum of the squared daily returns over the sample quarter.[2] Other variable definitions and predictions on their relationship to total risk are the same as presented above.

The sample examined in this study consists of the 85 bank holding companies used in the previous analyses. The bank holding company data come from Federal Reserve quarterly Y-9 Reports. Daily returns and equal-weighted market index come from CRSP New York Stock Exchange and NASDQ over-the-counter files.

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[2] See French, Schwert, and Stambaugh (1987) for a discussion of expected stock market returns and volatility.

Results

The results of estimating equation 5.4 are given in Table 5-2. The interpretation of the coefficients on the firm-specific attributes is illustrated in the following equation showing the result for large banks:

$$\begin{aligned} \mathrm{RET}_{it} = -0.016 + (&0.326 + 2.441\ \mathrm{CREDIT\ RISK} \\ &-0.166\ \mathrm{LIQUIDITY} + 0.480\ \mathrm{MATURITY} \\ &+ 0.039\ \mathrm{LEVERAGE} - 0.631\ \mathrm{LC} \\ &- 3.467\ \mathrm{TPG} - 0.321\ \mathrm{TPG{*}REG} \\ &+ 1.157\ \mathrm{LC{*}REG})\ \mathrm{MRET} + e_6. \end{aligned} \tag{5.6}$$

The coefficients on the independent variables (excluding the market return) represent each factor's estimated contribution to beta.[3]

The positive coefficient on LEVERAGE is consistent with expectation for both small and large banks. The MATURITY variable is expected to be positively related to risk. This is observed for large banks. The negative coefficient on this variable for small banks is contrary to expectation. Credit risk is found to have a positive coefficient, which is consistent with its hypothesized role in increasing operating risk. Loan commitments and third party guarantees are associated with lower beta for large banks in the pre-risk-based capital period. However, in the post-RBC period loan commitments are not associated with lower beta for large banks. For small banks, loan commitments appear to be positively related to beta in the post-RBC period. This suggests that the inherent nature of loan commitments may have changed after the new capital regulations took effect.

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[3] Brewer and Koppenhaver also estimate the returns model including the returns on short term Treasury bills to capture the change in unanticipated interest rates. This was also done in my analysis and the results are the same as those reported in Table 5-1.

The results of examining the relationship between contingent commitments and total risk (equation 5.5) are given in Table 5-3. The results of this analysis are consistent with the findings from examining beta. Loan commitments are negatively related to volatility in the pre-RBC period for large banks, and this association is not significant in the post-RBC period. Third party guarantees are negatively related to equity volatility in the post-RBC period.

The results of this study are contrary to results of Brewer and Koppenhaver (1992), who find that standby letters of credit are positively related to risk. They are also contrary to expectations about the effect of loan commitments on risk and changes resulting from risk-based capital.

Conclusions

The findings of this study suggest that off-balance sheet contingent commitments are associated with lower systematic and total risk. These results are contrary to the findings of prior studies that show that third party guarantees are positively related to risk. This negative association might be due to the effect of fee revenues from third party guarantees in reducing the variability of bank income. In addition, the decrease in the association between bank risk and loan commitments suggests that changes may have occurred in the nature of loan commitments that were issued after RBC rules were in place. These findings require further investigation into the potential causes.

TABLE 5-1

Variable Definitions and Basic Regression Equations

VOL = Volatility of stock returns is calculated as the sum of the squared daily returns over the sample quarter,

RET_i = Compounded daily returns for the ith firm over the sample quarter,

MRET_t = Compounded daily market returns over the sample quarter,

CREDIT RISK = Allowance for Loan and Lease Losses divided by total loans,

MATURITY = Assets maturing or repricing within one year less liabilities maturing or repricing within one year ÷ total assets,

LEVERAGE = Total assets divided by book value of equity,

TPG = Third party guarantees (standby and commercial letters of credit) divided by total assets,

LC = Loan commitments divided by total assets,

REG = Regulatory regime (REG=0 for pre-RBC period; REG=1 for post-RBC period),

LIQUIDITY = Liquidity ÷ total assets.

BETA MODEL:

$$\begin{aligned}\text{RET} = {} & \alpha_0 + \alpha_1\,\text{MRET} + \alpha_2\,\text{CREDIT RISK*MRET} + \alpha_3\,\text{LIQUIDITY*MRET} \\ & + \alpha_4\,\text{MATURITY*MRET} + \alpha_5\,\text{LEVERAGE*MRET} + \alpha_6\,\text{LC*MRET} \\ & + \alpha_7\,\text{TPG*MRET} + \alpha_8\,\text{REG*TPG*MRET} + \alpha_9\,\text{REG*LC*MRET} + e\end{aligned}$$

VOLATILITY MODEL:

$$\begin{aligned}\text{VOL} = {} & \alpha_0 + \alpha_1\,\text{CREDIT RISK} + \alpha_2\,\text{LIQUIDITY} + \alpha_3\,\text{MATURITY} \\ & + \alpha_4\,\text{LEVERAGE} + \alpha_5\,\text{TPG} + \alpha_6\,\text{LC} + \alpha_7\,\text{REG*TPG} + \alpha_8\,\text{REG*LC} + e\end{aligned}$$

TABLE 5-2
Risk of Contingent Commitment Activity
BETA MODEL[a]

$$RET = \alpha_0 + \alpha_1\ MRET + \alpha_2\ CREDIT\ RISK*MRET + \alpha_3\ LIQUIDITY*MRET + \alpha_4\ MATURITY*MRET + \alpha_5\ LEVERAGE*MRET + \alpha_6\ LC*MRET + \alpha_7\ TPG*MRET + \alpha_8\ REG*TPG*MRET + \alpha_9\ REG*LC*MRET + e$$

Panel a

	SMALL	LARGE
INT SE	-1.67E-2[b] 5.76E-3	-1.57E-2[b] 4.41E-3
MRET SE	0.017 0.232	0.326[b] 0.194
CREDIT RISK*MRET SE	9.249[c] 5.995	2.441 4.471
LIQUIDITY*MRET SE	-0.262 0.442	-0.166 0.307
MATURITY*MRET SE	-0.425[c] 0.316	0.480[c] 0.297
LEVERAGE*MRET SE	2.90E-2 [b] 1.50E-2	3.87E-2[b] 1.28E-2
LC*MRET SE	1.043 0.950	-0.631[c] 0.483
TPG*MRET SE	-4.000 6.713	-3.467[b] 1.750
REG*TPG*MRET SE	1.539 7.923	-0.321 2.449
REG*LC*MRET SE	0.373 1.171	1.157[b] 0.612
ADJ R^2	0.390	0.558

Panel b

POST-RISK-BASED CAPITAL COEFFICIENTS

	SMALL	LARGE
TPG ($\alpha_6+\alpha_8$) SE	-2.461 7.108	-3.788[b] 2.046
LC ($\alpha_5+\alpha_7$) SE	1.416[b] 0.704	0.526 0.492

[a] Variable definitions are given in Table 5-1.

[b] Significant at the 95% level for a one-tailed t-test using Newey-West standard errors.

[c] Significant at the 90% level for a one-tailed t-test using Newey-West standard errors.

TABLE 5-3
Risk of Contingent Commitment Activity
VOLATILITY MODEL[a]

$$\text{VOL} = \alpha_0 + \alpha_1 \text{ CREDIT RISK} + \alpha_2 \text{ LIQUIDITY} + \alpha_3 \text{ MATURITY} + \alpha_4 \text{ LEVERAGE} + \alpha_5 \text{ TPG} + \alpha_6 \text{ LC} + \alpha_7 \text{ REG*TPG} + \alpha_8 \text{ REG*LC} + e$$

Panel a

	SMALL	LARGE
INT SE	-1.34E-4 2.15E-4	-4.99E-4[b] 2.674E-4
CREDIT RISK SE	0.0587[b] 0.016	2.69E-2[b] 0.005
LIQUIDITY SE	-1.012-3[b] 3.55E-4	-4.31E-5 1.99E-4
MATURITY SE	-1.12E-4 6.203-4	-3.55E-5 1.92E-4
LEVERAGE SE	4.451-6 7.48E-6	4.89E-5[b] 1.81E-5
TPG SE	-2.166E-3 2.96E-3	-1.081E-3 1.17E-3
LC SE	1.29E-4 4.94E-4	-1.57E-3[b] 4.94E-4
REG*TPG SE	-7.29E-3 5.76E-3	-2.96E-3 2.56E-3
REG*LC SE	7.66E-5 7.20E-4	1.61E-3[b] 7.29E-4
ADJ R^2	0.309	0.234

Panel b

POST-RISK-BASED CAPITAL COEFFICIENTS

	SMALL	LARGE
TPG $(\alpha_5+\alpha_7)$ SE	-9.456[b] 4.852	-4.041[b] 2.797
LC $(\alpha_6+\alpha_7)$ SE	2.056 1.889	0.040 1.315

[a] Variable definitions are given in Table 5-1.

[b] Significant at the 95% level for a one-tailed t-test using Newey-West standard errors.

[c] Significant at the 90% level for a one-tailed t-test using Newey-West standard errors.

CHAPTER 6
CONCLUSIONS AND SUGGESTIONS FOR FUTURE RESEARCH

This dissertation examines two types of contingent commitments and their valuation, use, and risk implications. Prior studies on contingent commitments have been concerned with the question of why banks issue these commitments. Third party guarantees are believed to benefit banks by providing bank equityholders with subsidies from the FDIC and to increase the return on assets. Loan commitments differ from third party guarantees in their fee structure and the conditions under which they are exercised. It has been posited that loan commitments benefit banks by reducing contracting costs through repeat dealings, and serve to reduce the adverse selection problem for bank loans.

The first essay examines the use of third party guarantees and loan commitments by banks. Use of these instruments appears to shed light on bank strategy because banks with a higher ratio of loans to total assets also tend to have more loan commitments and third party guarantees outstanding. The change in capital requirements in 1988 made third party guarantees and certain types of loan commitments more costly for banks. In general, higher risk banks issue more contingent commitments, but risk-based capital requirements reduced the contingent commitment activity of riskier banks. In the post-risk-based capital period, banks that are more capitalized are more actively involved in off-balance sheet banking. On average the intensity with which bank use contingent commitments has not decreased. Growth in the ratio of loan commitments-to-total assets has continued since risk-based capital rules took effect, and growth in third party guarantees has decreased.

The nature of contingent commitments presents an interesting reporting dilemma because the difference between what can be objectively measured and the underlying value can be substantial. The second essay addresses the issue of how contingent commitments disclosures are interpreted by the market. It is found in chapter 4 that the relationship between equity value and contingent commitment disclosures can be negative or positive depending on the type of commitment. Third party guarantees act as insurance for bank customers in cases of default. Since the fees generated from such activities go through the income statement, the portion of a third party guarantee that remains off-balance sheet is a contingent liability. Consistent with expectation, the analysis finds that third party guarantees are negatively related to bank equity value, and this negative relationship increases after risk-based capital rules are in place. Loan commitments are found to be positively associated with bank equity value, which is consistent with the belief that they represent future loans. The positive association between loan commitments and equity value increases in the post-risk-based capital period, suggesting that the observed increase in value may be the result of an increase in expected future loans. Further research is required to examine the potential causes of this change.

The third essay of this dissertation examines the relationship between contingent commitments and bank risk. It had been widely believed that banks engaged in off-balance sheet activities to increase risk without incurring regulatory costs prior to risk-based capital regulation. Contrary to this belief, the findings of the third essay show that contingent commitments were negatively related to bank equity risk during this period. This might be attributable to the effect of fee revenues in reducing the variability of bank income. After risk-based capital regulations are in place, the negative association between equity risk and third party guarantees continues to exist. However, there is no association between loan commitments and risk during this period. This suggests that changes have occurred in the nature of loan commitments after risk-based capital regulations took effect. This also requires further investigation into the potential causes.

Two issues arise from the results of examining contingent commitment disclosures in this dissertation, and are the basis for suggested future research. First, the off-balance sheet disclosures reflect only a portion of the total effect these activities have on banks. The fee revenues generated from contingent commitments have not been examined in the analyses. Examination of fee income may provide further insights into the role of these commitments in bank choice, valuation, and risk. Finally, contingent commitments may play a unique role in the bank/customer relationship. Their use may be more closely tied to other components of banking, and therefore a more holistic approach to examining bank activities may be worthy of investigation.

APPENDIX A
THE EFFECT OF ADVERSE SELECTION ON LOAN COMMITMENTS

The following two period model illustrates how the adverse selection problem reduces the value of contingent commitments. This is most likely to be a problem with TPGs, however this can also affect value of LCs. Assume a bank issues TPGs to a continuum of identical potential borrowers at time t=0 that provide guarantees totalling TPG_0. This is the only activity carried out by the bank. Each borrower is allowed to exercise the credit commitment at a rate equal to the prime rate plus a risk premium $(r_p + k^*)$.

The bank charges an upfront fee (at t=0) for the guarantee. This is equal to $r_{fee} \cdot TPG_0$. At t=1 the TPG is exercised. When the commitment is exercised the borrower is given a one period loan at a rate of $r_p + k^*$. At t=2 interest is paid on these loans. The following time line depicts the model setup:

```
|----------------------------|----------------------------|
t=0                         t=1                          t=2
TPG                         TPG                      interest
written                 exercised:                paid on loan
                        loan issued
```

At t=1 each borrower learns their publicly observable credit risk k, where: $0 < k < k^H$. More specifically, at t=1 each borrower can borrow in the spot market at r_p+k. A firm will compare rates under the commitment (r_p+k^*) and the spot market (r_p+k) to determine whether to exercise the commitment.

The distribution of borrower credit risk is assumed to be uniform over the range $(0,k^H)$. Third party guarantees are exercised when k* is less than the credit risk assessed in the spot market (k* represents the point at which the spot rate and TPG rate are equal). When $k > k^*$, commitments are more valuable to borrowers than spot loans and hence will be exercised.[1]

Borrower Credit Risk for TPG commitments at t=1:

```
|--------------------------|-------------|
0                          k*            kH
                           |-------------|

                        TPG commitments
                        exercised
```

Since k is distributed uniformly, the expected takedown rate is $(k^* + k^H)/k^H$, thus the expected amount of loans to be taken down is $(k^* + k^H)/k^H \cdot \mathrm{TPG}_0 \approx d$. The present value of interest revenues at t=1 is

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[1] Note that the timing of fee collection is critical for contingent commitments. If fees are collected at the time of takedown, only the high risk borrowers would be paying fees. In order for the zero profit requirement this would require that the fees be sufficiently high to incorporate the risk of these borrowers. Since costs would be fully incorporated into loan prices there would be not incentive to contract for loan commitments.

$$E\ (\text{ PV of interest revenues }) = \frac{d \cdot (1 + r_p + k^*)}{(1 + r_p + \frac{(k^* + k^H\ )}{2}} \tag{A.1}$$

The discount rate ($[k^*+k^H]/2$) reflects the average default risk associated with the high risk borrowers that exercise commitments. The expected present value of the interest revenues is less than d because the commitments are exercised only if the borrower's credit risk has declined from the time the commitment was issued.

The cost of funding loans taken down at t=1 increases with the amount to be funded. The cost of funding is denoted $r_n(d)$ where $r_n' \geq 0$ and $r_n(0) < r_p$. The assumption that $r_n(0) < r_p$ simply reflects the notion that deposit rates are less than the prime lending rate. The cost of funding these loans is equal to

$$\text{funding cost} = [\ 1 + r_n(d)]\ \cdot\ d \tag{A.2}$$

The present value of TPGs at t=0 can be written as

$$\begin{aligned} V_0^{TPG} &= \text{fee revenues} + E(\text{net revenues from loans taken down}) \\ &= \text{fee revenues} + E(\text{interest revenues}) \\ &\qquad - E(\text{funding costs}) - E(\text{default losses}) \\ &\qquad - E(\text{regulatory costs}) \end{aligned}$$

$$
\begin{aligned}
&= r_{fTPG} \cdot TPG_0 + E\left[x \cdot TPG_0 \cdot \frac{(1 + r_p + k^*)}{(1 + r_p + \frac{(k^*+k^H)^2}{2}}\right] \\
&\quad - E\left[x \cdot TPG_0 \cdot \frac{(1 + r_n(d))}{1 + r_c}\right] \\
&\quad - E(L_D) - C_R.
\end{aligned}
\tag{A.3}
$$

where r_c is the bank's discount rate.

Finally, in a competitive equilibrium r_{fee} is set such that V_0^{TPG} (equation A.3) is equal to zero. In particular, the aggregate fee revenues equal the expected net revenues from loans taken down. Since TPGs are only exercised when they benefit the borrower, the expected net revenues of the loans taken down is always negative and outstanding TPGs are contingent liabilities to the bank.

APPENDIX B
ECONOMETRIC SPECIFICATION AND THE NEWEY-WEST CORRECTION

Panel data was used throughout this dissertation, which includes both time series and cross-section data. The problems associated with using such a dataset include heteroscedasticity and autocorrelation in the disturbance terms. Several approaches were attempted to correct these problems including a two step procedure which involved using a Prais-Winsten (cited in Greene 1993) autocorrelation correction, and then a weighted least squares using estimated functions of the heteroscedasticity source as weights. The results reported in this dissertation are based on an ordinary least squares estimation, which produces unbiased estimates of the coefficients. A procedure was then used to estimate the Newey-West (cited in Greene 1993) consistent covariance matrix which incorporates both autocorrelation and heteroscedasticity. Therefore, the results presented are unbiased and consistent, but not necessarily efficient.

The estimated model for panel data is

$$(y_{it} - \overline{y}_i) = (x_{it} - \overline{x}_i)' \beta + (\mu_{it} - \overline{\mu}_i) \qquad \text{(B.1)}$$

where

i= firm 1 to N
t= quarter 1 to T.

The estimated coefficients allowing firm-specific intercept shifts are

$$\beta = (\sum_{i=1}^{N}\sum_{t=1}^{T} (x_{it} - \overline{x}_i)(x_{it} - \overline{x}_i)')^{-1} \sum_{i=1}^{N}\sum_{t=1}^{T} (x_{it} - \overline{x}_i)(y_{it} - \overline{y}_i) . \tag{B.2}$$

Therefore the estimated residuals are

$$(\beta - \beta) = (\sum_{i=1}^{N}\sum_{t=1}^{T} (x_{it} - \overline{x}_i)(x_{it} - \overline{x}_i)')^{-1} \sum_{i=1}^{N}\sum_{t=1}^{T} (x_{it} - \overline{x}_i)(y_{it} - \overline{y}_i)(\mu_{it} - \overline{\mu}_i) . \tag{B.3}$$

These residuals are distributed normally with zero mean and variance equal to Q^{-1} V Q^{-1}:

$$NT\ (\beta-\beta) \rightarrow N\ (0,\ Q^{-1}\ V\ Q^{-1}\ ) \tag{B.4}$$

where

$$\hat{Q} = \frac{1}{NT} \sum_{i=1}^{N} \sum_{t=1}^{T} (x_{it} - \overline{x}_i)(x_{it} - \overline{x}_i)') \rightarrow Q. \tag{B.5}$$

The estimate of V is given by

$$\hat{V} = \frac{1}{NT} \sum_{i=1}^{N} \hat{V}_i . \qquad (B.5)$$

The covariance matrix for each firm i is

$$\hat{V}_i = \left(\sum_{j=1}^{L} \sum_{t=j+1}^{T} w_j (\mu_{it} - \overline{\mu}_i)(\mu_{it-j} - \overline{\mu}_i)\right) \cdot (x_{it} - \overline{x}_i)(x_{it-j} - \overline{x}_i)' + (x_{it-j} - \overline{x}_i)(x_{it} - \overline{x}_i)' . \qquad (B.6)$$

where

$w_j = 1 - j/(L+1)$

L = number of time lags.

Therefore, the consistent covariance matrix Q^{-1} V Q^{-1} can be estimated. The square root of the diagonal terms are consistent standard errors which are reported in the dissertation.

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BIOGRAPHICAL SKETCH

Carolyn Tome Takeda-Brown was born in Toronto, Canada, on March 25, 1961. She received a B.Comm. degree from McMaster University in 1985 and a M.Sc. in Accounting from Kent State University in 1987. She entered the accounting Ph.D. program at the University of Florida in August 1987. Takeda-Brown visited at the Federal Reserve Bank of Atlanta in 1992 and returned to Gainesville at the end of that year. After completion of the Ph.D. degree, she will be employed as an Assistant Professor of Finance at the University of Florida.

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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